ARCTIC EXPLORATION.

THE NORTH GERMAN POLAR EXPEDITION,

in the Year 1869-70, of the Ships 'GERMANIA' and 'HANSA,' under command of Captain KOLDEWEY.

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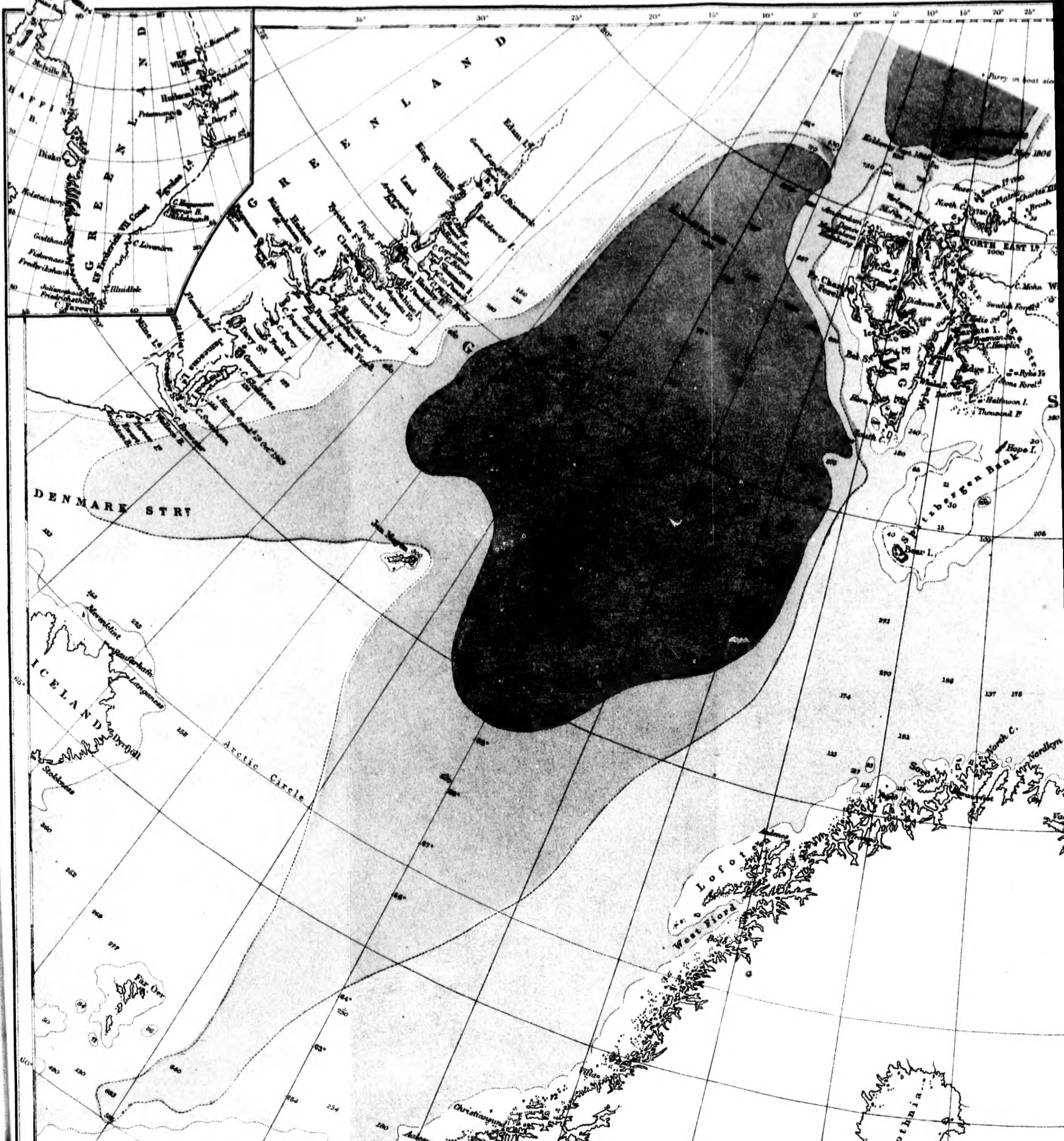

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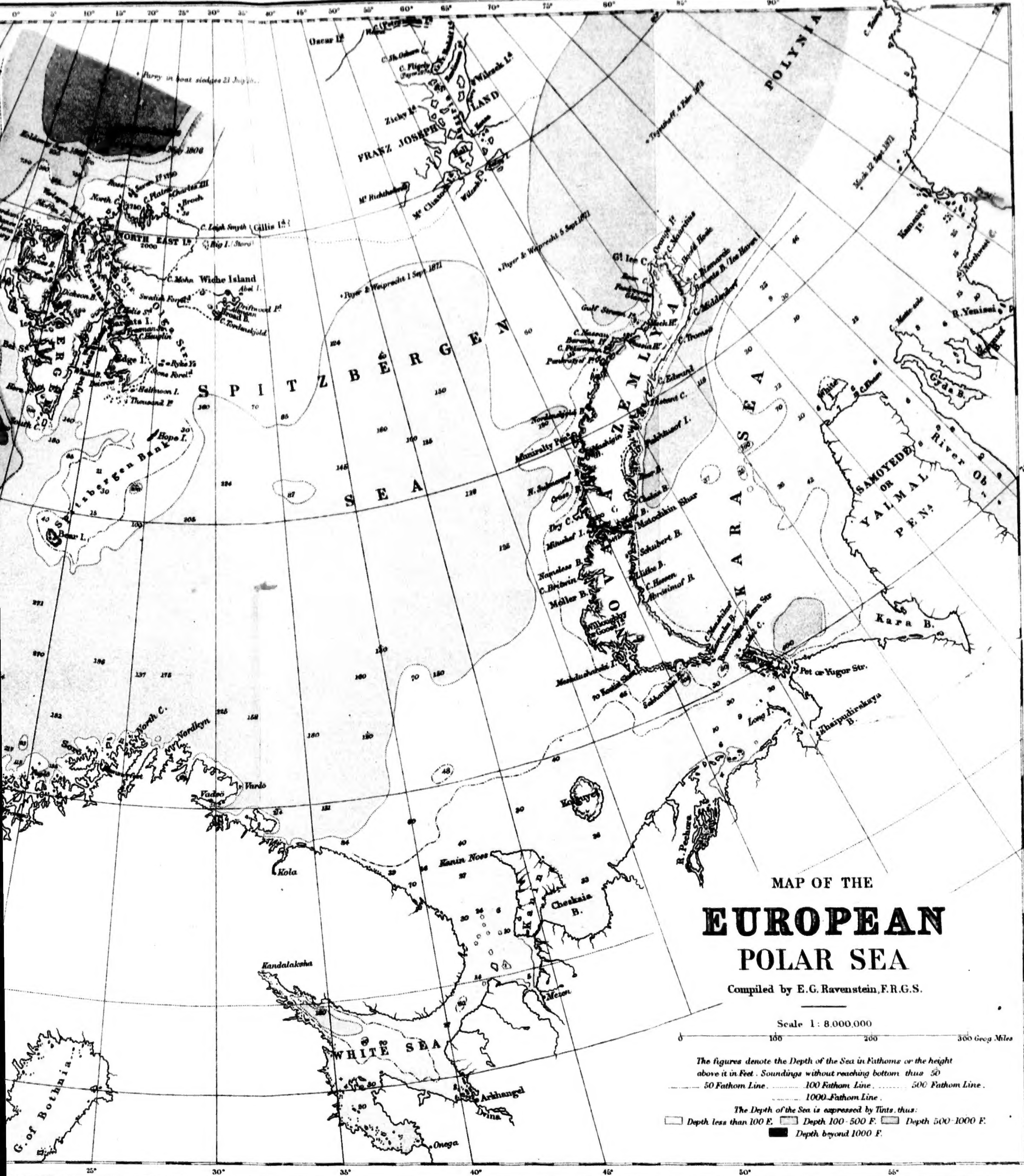

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Compiled by E. G. Ravenstein, F.R.G.S.

Scale 1 : 8,000,000

0 100 200 300 Geog. Miles

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OF THE
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BY

CLEMENTS R. MARKHAM, C.B., F.R.S.

SECRETARY OF THE ROYAL GEOGRAPHICAL SOCIETY
FORMERLY OF H.M. ARCTIC SHIP 'ASSISTANCE'

THIRD AND CHEAPER EDITION

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DEDICATION and PREFACE.

TO

ADMIRAL SIR GEORGE BACK, D.C.L., F.R.S.

Chairman of the Arctic Committee of the
Royal Geographical Society.

My dear Sir George,—I am happy to be allowed to dedicate this book to you, because you are the surviving link which connects the former with the present generation of Arctic explorers. You served in the first Arctic exploring voyage of this century, and your name is connected with some of the noblest efforts of subsequent years. You also formed one of the Arctic Council when the searches for Sir John Franklin's expedition were arranged, and you have ever since been the staunch advocate of the renewal of Arctic exploration. Your authority is based on the experience of fifty-seven years, during which time you have either been foremost in the ranks of the explorers, or have aided and encouraged a younger generation by wise advice and cheering words. You are the sole survivor of that gallant band which, under the lead of Buchan, made resolute efforts to pierce the Polar pack; as of that still more glorious party which, under Franklin, traversed the frozen lands of Arctic America. It was you who came to the front, when an arduous expedition was required for the relief of the Rosses; and no adventure of recent times can be compared with your wintering in the pack, and your voyage across the Atlantic in the sinking 'Terror.' When you pronounce that, with modern appliances and experience, the dangers of Arctic exploration are not of such a character as to make it foolhardy to encounter them, there is no other man living who can gainsay you; for there is none with the same knowledge and experience. We all know that you are intimately acquainted with the nature and character of the risks, and that you would be the last officer in the service to give imprudent advice; and hence it is that we look to you as the mainstay of a good cause, which is also unanimously supported by your brother Arctic explorers, as well as by the most eminent living men of science.

The object of the present volume is to give the public a correct knowledge of the whole line of frontier separating the known from the unknown region round the North Pole, to recall the stories of early voyagers, to narrate the recent efforts of gallant adventurers of various nationalities to cross the threshold, to set forth the arguments in favour of a renewal of Arctic exploration by England, and to enumerate, in detail, the valuable and important results to be derived from North Polar discovery.

My hope is that it will be of service, now that the people of England have revived their interest in maritime enterprise, and that it will continue to be useful for reference. I am very sure that such an object will receive the hearty approval of the Arctic Committee, and of their veteran Chairman, and that you will welcome the publication of this little volume, for such good as it may do, how much soever the performance may fall short of the intention.

I am, DEAR SIR GEORGE,

Yours with much regard,

CLEMENTS R. MARKHAM.

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July 20, 1873 (1*st ed.*)
Jan. 20, 1875 (3*rd ed.*)

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THE

THRESHOLD OF THE UNKNOWN REGION.

CHAPTER I.

THE PIONEERS OF POLAR DISCOVERY.

THE North Polar region, that immense tract of hitherto unpenetrated land and sea which surrounds one end of the axis of our earth, is the largest, as it is the most important, field of discovery that remains for this generation to work out. To the people of this country it should have a peculiar charm; for maritime, and especially Arctic enterprise, runs, like a bright silver thread, through the history of the English nation, lighting up its darkest and least creditable periods; and even giving cause for just pride, at times when all other contemporary events would be sources only of shame and regret. Glorious indeed is the story of those northern voyages which made illustrious the names of so many naval worthies of past days; and every true

Englishman should earnestly desire that the long roll may not be finally closed, and that this path to honour and distinction may be again thrown open to our Navy.

The undiscovered region is bounded on the European side by the 80th parallel of latitude, except where Scoresby, Parry, and a few others have slightly broken into its circumference; but on the Asiatic side it extends fully to 75° and 74°, and westward of Behring's Strait our knowledge is bounded by the 72nd degree. Thus, in some directions, it is more than 1,500 miles across, and it covers an area of upwards of 1,500,000 square miles. The parallel of 70° skirts the northern shores of the continents of Europe, Asia, and America; and between 70° and 80° there is an intervening belt separating the known from the unknown, which, in different directions, has been more or less explored by the intrepid seamen and travellers of various nations. Their successes and disasters, their daring exploits and wonderful adventures, form the record whence we must gather such information as is at present within our reach respecting the outer edge of the unknown Polar region. This information will assist us in the necessary speculations, whence we may derive an estimate of the uses and advantages that will be derived from a North Polar expedition.

Unlike the ocean-girt region of the Southern

Pole, the Northern Polar region is surrounded, at a distance of about 1,200 miles from its centre, by the three great continents of our planet, while the enormous glacier-bearing mass of Greenland stretches away towards the Pole for an unknown distance. There are three approaches by sea to this land-girt end of the earth: through the wide ocean between Norway and Greenland, through Davis' Strait, and through Behring's Strait—one wide portal and two narrow gates.

It is through the wide ocean portal that men first sought to reach the mysterious region of the Pole; and their discoveries in this direction will, therefore, first engage our attention. These discoveries form, altogether, a rich store of valuable information, acquired by an amount of skill and hardihood which commands our admiration, and through adventures and dangers which must needs excite our interest.

The honourable desire to explore unknown lands broke out very early in the history of the European races, and king Alfred of England told the story of the first Arctic Expedition as early as in A.D. 890. Richard III., the most active and industrious administrator among our English kings, set forth and encouraged voyages to Iceland; and in the reign of Henry VIII., Dr. Robert Thorne declared that 'if he had facultie to his will, the first thing he would understande, even to attempt, would be if our seas northwarde be navigable to the Pole or no.' Thus was the great question raised, and shortly after Henry's death, maritime enterprise broke forth with renewed vigour. Before many years the ships of England and Holland had reached the edge of the Polar pack. The commencement of Polar research may be dated from the day when Sebastian Cabot publicly explained to young Edward VI. the phenomena of the variation of the needle. On the same day the aged sailor received a pension, and immediately afterwards three discovery ships were fitted out by the Muscovy Company under his auspices. But neither the ill-fated Willoughby, nor the more fortunate Chancellor reached the verge of the unknown seas; so we pass on to their successors in Arctic research.

The spring of 1556 found Stephen Burrough, afterwards chief pilot of England, fitting out a little pinnace called the 'Search-thrift,' for further northern exploration. The venerable Cabot again appears, superintending the equipment, and heartily wishing the explorers God-speed. 'The good old gentleman,' says Burrough, 'came aboord our pinnace at Gravesend, accompanied with divers gentlemen and gentlewomen, and gave to the poore most liberal almes, wishing them to pray for the good fortune and prosperous successe of the "Serchthrift."' And then 'at the signe of the Christopher, he and his friends banketted, and made me and them that were in company great cheere: and for very joy that he had to see the towardness of our intended discovery, he entered into the dance himself, amongst the rest of the young and lusty company: which being ended, hee and his friends departed most gently, commending us to the governance of Almighty God.'[1] Surely this is a very pleasant picture: the great discoverer, whose labours had commenced nigh sixty years before, now, in his green old age, cheering on his young fellow-workers with hearty good wishes and sage advice. Some of us, who have served in Arctic searches, can remember a similar scene, when the tall figure and kind face of another great explorer, now no more, deepened the memory of his cheering words on the eve of our departure.

Burrough has left us a very complete journal of his voyage. Off Kola, in Russian Lapland, he fell in with many lodias, or native twenty-oared boats, which outsailed the 'Search-thrift' in running before the wind; but the friendly skipper of one of them kept company by occasionally lowering his sail, and so piloted Burrough to the eastward, besides presenting him with a barrel of mead. Burrough discovered the strait leading into the sea of Kara, between Novaya Zemlya and the island of Vaigats; but he made up his mind to return for three causes, namely, the continual north winds, the 'great and terrible abundance of ice which we saw with our eyes,' and thirdly because the nights waxed dark. He arrived at Archangel on September 11, where he wintered. The Muscovy Company considered this voyage to be a failure, so in 1568 they ordered three seamen, named Bassendine, Woodcocke, and Browne, to pass through the strait discovered by Burrough, and thence to sail eastward past the mouth of the river Ob. 'Which discoverie,' run the instructions, 'if it be made by you it shall not only prove profitable to you, but it will also purchase perpetual fame and renowne both to you and our country.' Would that instructions, couched in this noble spirit, were more common now!

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[1] Hakluyt, I. p. 307.

In May 1580, the Company fitted out two vessels with similar instructions, the 'George' (40 tons), commanded by Arthur Pet, with a crew of nine men and a boy, and the 'William' (20 tons), commanded by Charles Jackman, with five men and a boy. Pet had served in Chancellor's expedition, and had since commanded a vessel belonging to the Muscovy Company; and Jackman was a mate on board the 'Ayde,' in Frobisher's second voyage. They were both experienced and able seamen; and their persevering battle with the Polar ice in such wretched little cock-boats is one of the most intrepid feats in maritime history. Pet discovered the strait between Vaigats and the main land, and the little boats, after passing through it into the sea of Kara, made several attempts to bore through the heavy pack-ice, sometimes entering the pack, and occasionally making slight progress by sailing along lanes of water left between the grounded ice and the shore. In returning home the 'George' and 'William' were parted in a gale of wind. Pet reached England in safety; but Jackman, after wintering in a Norwegian part, sailed towards Iceland in the spring, and was never heard of more.

These early northern voyages led the way to an examination of the edge of the Polar pack between Greenland and Novaya Zemlya: for the discovery of the obstacles to navigation caused by heavy Polar ice in the sea of Kara induced explorers to turn their attention to the seas farther north. For this reason the enterprises of the successors of Willoughby and Chancellor appropriately form an introduction to the discoveries of later voyagers who have touched the frontier of the great unknown Polar region. Arctic exploration is now decried in some quarters, because it is alleged to be unlikely to produce much commercial profit. Milton took a different view. He said that these early enterprises 'might have seemed almost heroic, if any higher end than excessive love of gain and traffic had animated the design.'[1] This may sound an overstrained sentiment to modern ears; yet there is the ring of true metal in the words of the great poet, such as is not so often heard in these days.

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[1] Milton's Prose Works. 'A Brief History of Muscovia' (ed. 1834), p. 577.

CHAPTER II.

WILLIAM BARENTS.

THE Dutch had not only watched the English pioneers of Arctic discovery very attentively: their merchants had themselves opened a trade with Kola and Archangel as early as 1578. But the obstacles to any progress eastward, caused by the heavy ice in the sea of Kara, turned the attention of Dutch navigators to the possibility of a passage round the northern end of Novaya Zemlya, and thus the first true Polar voyage was projected. The credit of its conception is due to the great cosmographer Peter Plancius, who recommended this route to the merchants of Amsterdam. In 1594 the Amsterdammers fitted out a vessel of about 100 tons, called the 'Mercurius,' and they were most fortunate in their choice of a commander. William Barents was a native of the island of Terschilling, near the Texel, a man of some education, a most accurate observer, and a bold and enterprising seaman. As some of our most valuable information respecting the Polar ice between Spitzbergen and Novaya Zemlya is derived from the labours of Barents, it is certainly most fortunate that perfect reliance can be placed on the observations of this able leader of the first true Polar voyage.

On June 4, 1594, Barents sailed from the Texel in the 'Mercurius,' with a little fishing-smack, belonging to his native island of Terschilling, in company, and sighted Novaya Zemlya, in latitude 73° 25′ N., on the 4th of July. He sailed along the coast, passing Cape Nassau on the 10th, and arrived at the edge of the ice on the 13th. From July 13 to August 3, Barents continued to seek a passage through the pack, searching for a lane in every direction, from Cape Nassau to the Orange Islands at the extreme north-west of Novaya Zemlya. During this close and careful examination of the pack edge, Barents sailed over 1,700 miles of ground, and put his ship about no less than eighty-one times. Assuredly, if ever perseverance deserves success, it should have been conceded to this indefatigable explorer. From time to time he carefully observed the meridian altitude of the sun, both with a cross-staff, with an astrolabe, and with a quadrant; he discovered a long line of coast from Cape Nassau to the Orange Isles, and fixed the latitudes of various points with remarkable accuracy. We are indebted to Dr. Petermann for the valuable map, on which the track of Barents during his first voyage is accurately delineated, drawn to illustrate Dr. Beke's edition of the great explorer's voyages, which was printed for the Hakluyt Society in 1853. At last the men wearied of the incessant boxing about along the edge of the pack, and it became necessary to return. The second voyage in which Barents was engaged merely sailed to the entrance of the sea of Kara and back.

We now come to the third voyage of Barents, perhaps the most important, next to Hudson's, of all the voyages that have been made to the frontier of the unknown Polar region. The States-General determined that it would not be advisable to make any farther attempt after the failure of the fleet with which Barents made his second voyage, which had been fitted out at great expense. But the merchants of Amsterdam listened to the representations of the cosmographer Plancius, and of the practical seaman Barents, and resolved to fit out another expedition. Two vessels, commanded by Jacob van Heemskerch and Jan Corneliszoon Rijp, were accordingly commissioned. Heemskerch was accompanied by Barents as pilot, who was virtually in command, and Gerrit de Veer, the historian of the voyage, was also on board as second mate. The two vessels sailed from Amsterdam on May 13, 1596.

The masses of ice in the strait leading to the sea of Kara, and the impenetrable nature of the pack near Novaya Zemlya, had strongly impressed both Barents and Rijp with the necessity of avoiding the land, and by keeping a northerly course, of seeking a passage in the open; for there was a prevalent but erroneous opinion in those days, that ice could only be formed under the shelter of the land. Indeed, Rijp insisted upon keeping away much farther to the westward than Barents considered necessary, fearing that they might get entangled in the ice round the strait of Vaigats. On June 9, they discovered an island which they called Bear Island. Stephen Bennet, who was sent on a voyage by Sir Francis Cherie of London in 1603, fell in with it, and, ignorant of the previous discovery of Barents, called it Cherie Island. The two ships continued to steer north, passing a good deal of ice, until they sighted Spitzbergen on June 19. They believed it to be a part of Greenland, and sailed away in a north-westerly direction, but were stopped by the Polar pack. Barents then coasted along the western side of Spitzbergen; and at the north-western point he found so great a number of birds that they flew against the sails, so he called the point Vogelsang. But he did not, as Dr. Beke and Dr. Petermann supposed, sail up the east side and circumnavigate the largest island in the group. That feat has never yet been performed, except by Captain Carlsen in 1863. Dr. Beke adopted the circumnavigation theory from the statement, in Gerrit de Veer's journal, that Barents steered a little east of north from Bear Island. But the journal is vague, and other entries go to prove that the ship of Barents was never on the east coast. De Veer speaks of land on his right hand, and of an east wind coming off the land. The question is set at rest by the nearly contemporaneous map of Hondius, which was specially prepared to illustrate the '*admiranda navigatio*' of Barents, and published, in 1611, in the work on Amsterdam by Pontanus. It shows a small portion of the western and northern shores of Spitzbergen, and the track of Barents. He arrived at Bear Island again on July 1, where he and Rijp agreed to separate. Rijp went up the east side of Greenland, expecting to find an opening in the ice, while Barents shaped a course more to the eastward. There is no account of the further proceedings of Rijp, but no doubt he was stopped by the Polar pack, and he returned to Holland the same year.

The record of the subsequent proceedings of Barents and his crew, of their famous voyage round the north-western end of Novaya Zemlya, and of their terrible sufferings in the first Arctic winter ever faced by Europeans, is exceedingly interesting, as it is told in the simple, straightforward narrative of honest Gerrit de Veer. The voyage from Bear Island to Novaya Zemlya lasted from July 2 to 17, and although they went a good deal to the southward, they were frequently obliged to alter their course on account of the ice. On the 14th, indeed, 'they sayled so farre into the ice that they could go no further: for they could see no place where it opened, but were forced (with great paine and labour) to lauere[1] out of it againe, and they were then under 74° 10′ N.' They sighted the coast of Novaya Zemlya in 74° 40′ N., and sailed along it until, on August 7, they passed Cape Comfort. The coast here runs east and west, and faces to the north, so that the Polar pack, when it drifts south, is forced full upon it.

After several fruitless attempts to extricate himself from the ice, by tacking about in various directions, Barents found himself on the west side of a bay which was named 'Ice Haven,' and 'here they were forced, in great cold, poverty, misery, and griefe to stay all the winter.' This was on August 26. The heavy pack-ice drifted into the bay, gave the old craft several very severe nips, and fixed her immovably for the winter. In the calm weather which followed, the young ice began to form on the surface of the sea; but, as often happens just before winter fully sets in, some westerly winds sprang up towards the end of September, drove the ice off the shore, and left a wide expanse of open water to seaward. The Dutchmen, however, found no comfort in this, for, their craft was firmly wedged into the bay, by grounded masses of pack-ice. This was perhaps fortunate, for had they stood out into the treacherous October sea, they would soon have been beset in the young ice, and have had to winter in the pack, in a position of extreme danger. As late as November 8, some days after the sun disappeared, lanes of open water were seen beyond the bay when it had been blowing from the land; and even on December 24 the ice was in motion.

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[1] To advance by repeated short tacks.

The seventeen stout-hearted Dutchmen now had to prepare for an Arctic winter, and it is impossible to speak too highly of the cheerful way in which they set to work, of their discipline, and of their resolute determination to endure the worst that might befall them, with courage and subordination. Their countrymen may well be proud of the conduct of these gallant seamen. Fortunately they found a large supply of drift-wood, and with this material, eked out by planks from the poop and forecastle of the ship, they built a house, into which they removed all their provisions and valuables. A chimney was fixed in the centre of the roof, a Dutch clock was set up and made to strike the hours, bed-places were placed along the walls, and a wine-cask was converted into a bath. The surgeon wisely prescribed bathing as a necessary preservative of health. Snow-storms and gales of wind prevailed throughout the winter, which had the good effect of drifting snow round the house as high as the roof, and thus raising the temperature within. But their sufferings were intense, and it is touching to read of these poor fellows asking their skipper to let them make merry on Twelfth Night with a little sack and two pounds of meal.

The sun returned on January 24. On February 22 they again saw 'much open water in the sea, which in long time we had not seene;' and enormous quantities of snow fell during the whole month. On March 6 they again saw much open water, and on the 8th there was no ice in sight to the north-east, while to the south the sea was covered with it. But on the 12th a N.E. wind brought all the ice back again, and the open water disappeared. 'The ice mightely driving in with a great noyse, the pieces rushing against each other fearfull to heare,' and on the 14th there was nothing but ice to be seen. A S.W. wind brought open water again on the 28th, but this only lasted for a day; and from the 29th to April 8 the ice was so closely packed as ever. On May 11 the sea was quite navigable, although the N.E. winds always brought the ice again.

Barents had been long ill, and when they set sail from the dismal scene of their sufferings, in two

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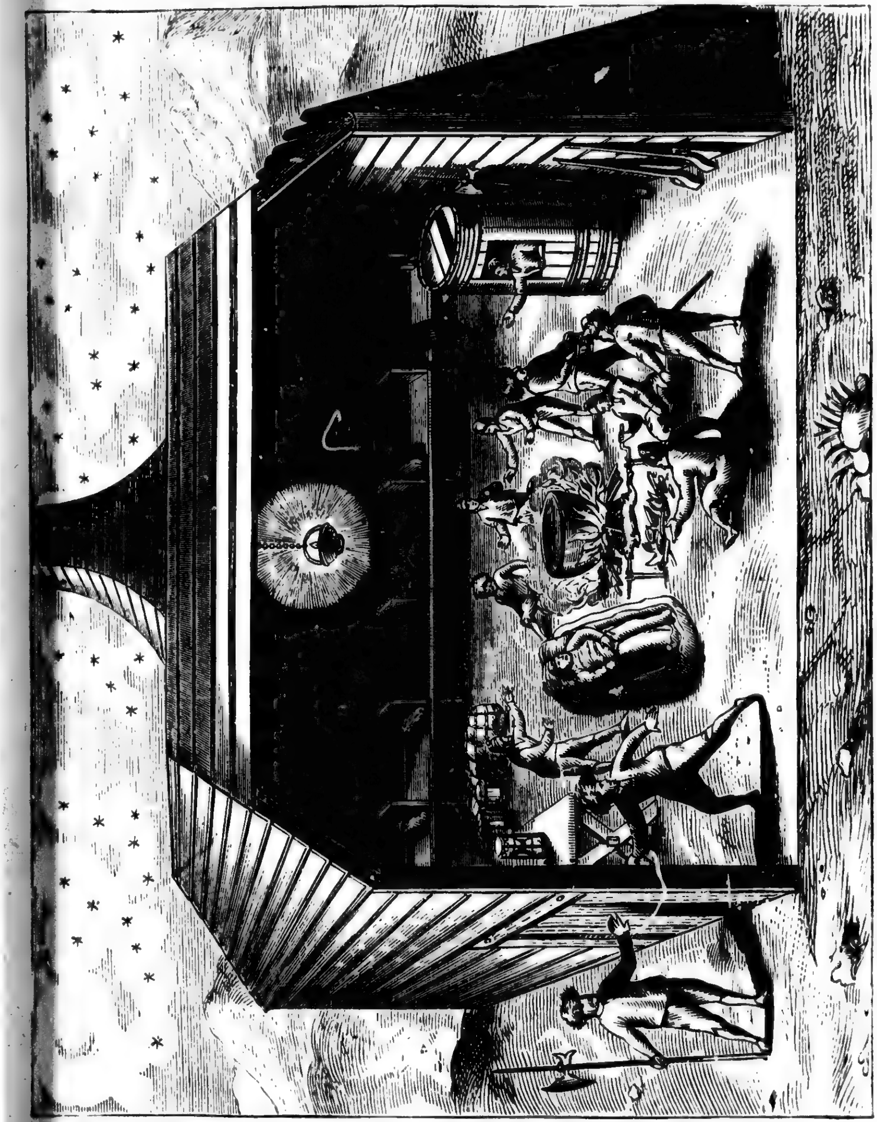

The exact manner of the house wherein we wintered.—*Gerrit de Veer.*

open boats, on June 14, 1597, he was too weak to stand, and was carried from the house. On the 16th the skipper hailed from the other boat, and asked how the pilot was. 'Quite well, mate,' was the reply. 'I still hope to mend, before we get to Wardhouse.'[1] But he died on the 19th, and, like La Pérouse and Franklin, found a grave in the midst of his discoveries.

The survivors encountered many difficulties from the ice, sometimes being drifted away from the land-floe, and at others being obliged to haul the boats for long distances over the ice to reach open water. At last, after a long and dangerous voyage, they reached Kola, in Lapland, towards the end of August, and by a strange coincidence were picked up by a Dutch ship commanded by the very Corneliszoon Rijp who had been skipper of their consort in the previous year. We last hear of these gallant fellows telling their story to the Prince of Orange and the Danish Ambassador after a grand dinner. They then dispersed to their homes, and are lost to us.

There are two points in this remarkable voyage which are deserving of special attention, as connected with North Polar exploration. The pressure of the Polar pack on the northern coast of Novaya Zemlya, from Cape Nassau to the Orange Islands, is described by De Veer as terrific. The currents, no doubt, have something to do with the formation of this tremendous pack.

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[1] An island on the coast of Lapland.

The appearance of open water at the north-eastern extremity of Novaya Zemlya during March and April, on several occasions, is the second point. It appears that during those months, and once even in February, when there was a S.W. wind, the ice was always driven away from the coast, leaving a space of open water and that, directly the wind came from the opposite quarter, the ice returned, and ground furiously and noisily upon the beach. In the same way an off-shore wind carries away the ice from the head of Baffin's Bay at *all* seasons of the year. This, of course, argues the existence of some open space in the rear, to the north-west, into which the ice could drift. This drift would be in the direction of Capes Taimyr and Cheliuskin, the most northern points of Siberia; and it is quite clear, therefore, that water-holes exist along the coast of Siberia in February and March, caused by currents and gales of wind. They were met with by Anjou and Wrangell, and the information supplied by Gerrit de Veer confirms the accuracy of the Russian reports. The continuous succession of heavy snow-storms with which Barents was visited during the Novaya Zemlya winter also proves the existence of open water at no great distance. When the Arctic regions are in their normal condition during winter, an uninterrupted frozen surface is accompanied by a clear dry atmosphere, while a different state of the ocean produces atmospheric results of an opposite character. The snow-storms during the Novaya Zemlya winter are the natural consequences of the water-holes on the Siberian coast. The same thing, from a similar cause, was experienced by Hayes at Port Foulke, and by McClintock at Port Kennedy.

We have no authentic account of any vessel having visited the spot where Barents wintered until 1871. The voyage of Barents, though the first, remained the only one which had rounded that N.E. point of Novaya Zemlya; and the house of Barents was unvisited for 278 years. But the spell was broken in 1871. On May 10, Elling Carlsen, a Norwegian captain, who had been engaged in the North Sea trade for eighteen years, sailed from Hammerfest, in a sloop of sixty tons, called the 'Solid.' He reached the 'Ice Haven' of Barents on September 7, and on the 9th he saw a house standing at the head of the bay. He found it to be 32 feet long by 20 broad, and the planks of which it was composed were 1½ inches thick by from 14 to 16 inches broad. The materials had evidently belonged to a ship, and amongst them were several oak beams. Round the house were standing several large puncheons, and there were also heaps of reindeer, seal, bear, and walrus bones. The interior is described by Captain Carlsen exactly as represented in the curious old drawing in Gerrit de Veer's narrative, which was reproduced in the edition of the Hakluyt Society. The row of standing bed-places along one side of the room was exactly as shown in the drawing, and several of the articles represented in the drawing, the clock, the halberd, and the muskets were still in their old places. The following is a catalogue of things found by Captain Carlsen in the winter quarters of Barents:—

Iron frame, over the fire-place, with shifting bar.
Two ships' cooking-pans of copper, found standing on the iron frame, with the remains of a copper scoop.
Copper bands, probably at one time fastened round pails.
Bar of iron.
Iron crowbar.
Long gun-barrel.
Two smaller gun-barrels, one square externally.
Two borers or augers, 3 feet long.
Chisel.
Padlock.
Cauking-iron.
Three gouges.
Six files.
Plate of zinc.
Earthenware jar.
Tankard, with lid of zinc.
Lower half of another tankard.
Six fragments of pepper-pots.
Clock.
Bell of clock.
Striker.
Rasp.
Small auger.
Small narrow pieces of copper band.
Two salt and pepper-pots, about eight inches high.
Two pairs of compasses.
Fragment of knife with iron handle.
Three spoons.
Borer.
Hone.
Wooden tap.
Bronze tap.
Two wooden stoppers for gun muzzles.
Two spear or ice-pole heads.
Four navigation instruments.
A flute.
Lock with key.
Another lock.
Sledge-hammer head.

Tin meat-strainer.
Pair of boots.
Sword.
Fragments of many engravings, with Latin couplets under them.
Three books in Dutch.
A small piece of metal.
Nineteen cartridge cases, with tops and strings attached, some still full of powder.
Iron chest with lid, and intricate lock-work.
Fragments of metal handle belonging to the chest.
Grindstone.
Iron weight of 8 lbs.
Small cannon-ball.
Gun-lock, with hammer and flint.
Clock weight.
Twenty-six pewter candlesticks and fragments; six in perfect preservation.
Pitcher of Etruscan shape, beautifully engraved.
Upper half of another pitcher.
Wooden trencher, coloured red.
Alarum of clock.
Three scales.
Four medallions, circular, about 8 inches in diameter, three of them mounted in oak frames.
A string of buttons.
Hilt, and a foot of blade, of a sword.
A halberd head.
Two carved pieces of wood, one with the haft of a knife in it.

The house in which Barents and his gallant crew had wintered can never have been entered by human foot during nearly three centuries that have since elapsed. There stood the cooking-pans over the fire-place, the old clock against the wall, as shown in the drawing, the arms and tools, the drinking vessels, the instruments, and the books that had beguiled the weary hours of that long night, two hundred and seventy-eight years ago. The 'History of China' points to the goal which Barents sought, while the 'Manual of Navigation' indicates the knowledge which guided his efforts. Stranger evidence never told a more deeply-interesting story.

Captain Carlsen finally sailed from the 'Ice Haven' on September 14, and made his way down the eastern side of Novaya Zemlya. He encountered the same weather as Barents had done; a S.W. gale blowing the ice off the shore until a shift of wind to the N.E. brought it back and beset the vessel. Towards the end of the month the position became very serious, as the young ice was beginning to form and they were beset, but fortunately a south wind set in, driving the ice northwards, and on October 6 they passed through Burroughs Strait, and thus succeeded in circumnavigating Novaya Zemlya. But Carlsen very narrowly escaped the fate of Barents.

On the 4th of November 1871, Captain Carslen completed his adventurous voyage by anchoring once more at Hammerfest; and Mr. Lister Kay, who happened to be there on his way to Lapland, purchased the relics of Barents, and also obtained a copy of Captain Carlsen's log and chart. The Dutch Government, by paying Mr. Kay the price he gave for them, have secured the precious relics for preservation in the native land of the great navigator.

Mr. De Jonge has since done good service by publishing the results of his careful examination of these Barents relics.[1] He and his countrymen feel an affectionate pride in the glorious deeds of their 'Sea fathers,' and will cherish these memorials of a very noble achievement with careful reverence. They have been deposited in the Naval Museum at the Hague, where a house, open in front, has been constructed for their reception, in exact imitation of the woodcut, at page 17 of this volume. In a pamphlet, published at the Hague in 1872, Mr. De Jonge first proves the authenticity of the relics, then gives an account of the voyage of Barents, and of his wintering in Novaya Zemlya, then considers the question whether any voyager had visited the wintering place before 1871, and lastly gives a detailed description of each relic, appending several historical and antiquarian notes.

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[1] 'Nova Zembla. De voorwerpen door de Nederlandsche Zeevaarders na hunne overwintering aldaar in 1597, achtergelaten en in 1871 door Kapitein Carlsen teruggevonden.' Beschreven en toegelicht door Zhr. Mr. J. K. J. De Jonge, Adjunct. Rijks Archivaris 's Gravenhage, 1872.

The most important point in Carlsen's voyage is his correction of the north-eastern prolongation of Novaya Zemlya. To the north of the Matosken Strait he met another Norwegian captain, named F. Mack, in a vessel from Tromsö, and they agreed to keep company. Mack was supplied with good instruments from the Meteorological Institute at Christiania, and the result of their observations was that the north-eastern end of Novaya Zemlya is incorrectly laid down in modern maps. It is placed in 73° E., while the observations of Mack and Carlsen give 67° 30′ E. as its longitude. On September 3, the two vessels parted company in a thick fog. The map of this extremity of Novaya Zemlya, by Carlsen, agrees well with that published by Gerrit de Veer, the historian of the voyage of Barents in 1598; and Mr. De Jonge gives a map showing the two, together with the erroneous prolongation to the eastward on other recent maps. Mr. De Jonge then shows that the Russians have never visited the winter quarters of Barents, and that, though the Dutch navigator Vlamingh was very near them in 1664, he never landed nor saw the house. The account of the voyage of Vlamingh is given by Witsen.

Mr. De Jonge gives an extremely interesting note on the old clock, and another on a curious copper dial, through the middle of which a meridian is drawn. He believes this dial to be an instrument for determining the variation of the compass. Plancius, the famous cosmographer and tutor of Barents, invented such an instrument to work on an astrolabe, by which to calculate the longitude at sea. At the time when the expedition sailed, in 1596, Plancius was very busy with his theory of finding the longitude by the variation of the compass. With this object, he constructed a copper dial to be fixed on the astrolabe; and it is probable that this interesting relic is the only extant example of the invention of Plancius. Of the three books among the relics, one is a translation of the work of Medina on seamanship, being the edition of 1580. An improved edition was published at Amsterdam in 1598, a proof that the ship sailed between those years, for a careful pilot like Barents would be sure to take out the latest edition of such a work. Mr. De Jonge considers this to be additional proof of the authenticity of the relics. The other books are a chronicle of Holland, and a Dutch translation of Mendoza's 'History of China.'

These are perhaps the most valuable relics in an antiquarian point of view; but not the least interesting are the flute, which will still gives out a few notes, and the small shoes of the poor little ship's boy, who died during the winter.

CHAPTER III.

HENRY HUDSON.

Among the most important voyages that ever have yet been undertaken in the direction of the unknown Polar region are, undoubtedly, those of Henry Hudson; for this able and persevering seaman examined the whole extent of the ocean which leads to it, searching for an entrance along the pack edge from Greenland to Novaya Zemlya.

Nothing whatever is certainly known of the early history of Hudson, although General Meredith Read, in his valuable 'Historical Inquiry,' has made some probable conjectures as to his parentage.[1] He first appears fitting out a little cockboat for the Muscovy Company, called the 'Hopewell' (80 tons), to discover a passage by the North Pole. On May 1, 1607, he weighed anchor at Greenwich. When we consider the means with which he was provided for the achievement of this great discovery, we are astonished at the fearless audacity of the attempt. Here was a crew of twelve men and a boy, in a wretched little craft of eighty tons, coolly talking of sailing right across the Pole to Japan, and actually making as careful and judicious a trial of the possibility of doing so, as has ever been effected by the best equipped modern expeditions. Nor was Hudson ignorant of the difficulties and dangers of such a voyage, for the result of the three expeditions of Barents were known to him, and he had with him the best existing charts.

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[1] General Read's view is that the great navigator was a grandson of another Henry Hudson, who died, when an Alderman of London, in 1555. Henry, the navigator, was a citizen of London, and had a house there, and was bred up in the service of the Muscovy Company.—*An Historical Inquiry concerning Henry Hudson, by John Meredith Read, Jun.* (*Albany*, 1856).

Imagine this bold seaman sailing from Gravesend, bound for the North Pole, in a craft about the size of one of the smallest of modern collier brigs. We can form a good idea of her general appearance, because three such vessels are delineated on the chart drawn by Hudson himself. The 'Hopewell' was more like an old Surat buggalow than anything else that now sails the seas, with high stern, and low pointed bow; she had no head sails on her bowsprit, but to make up for this, the foremast was stepped chock forward. There was a cabin under the high and narrow poop, where Hudson and his little son were accommodated, and the men were crowded forward. Thus equipped and provided for the voyage, Hudson, as we have seen, sailed from Greenwich and passed the Shetland Islands on May 26, 1607. He came in sight of the east coast of Greenland, which he describes as a very high land with much ice near the shore, on June 13, and continued to stand along it with a northerly course, until the 22nd. Although he was stopped in this direction, yet he considered the time well spent, seeing that extensive land had been discovered which was not marked on any chart, and he adds 'for aught we could see, it is like to be a good land and worth the seeing.' He named it 'Hold with Hope,' and found his latitude, when in sight of it on the 22nd, to be 73° N. Hudson then left the Greenland coast, and, steering in a north-easterly direction for five days, came in sight of a part of Spitzbergen, or Newland as he called it, which he supposed to be the Vogelsang of Barents. The ice was found in latitude 78° 30′ N. trending away from Spitzbergen to the westward; and the little craft was 'in many dangers amongst so huge a quantity of ice and fogge.' Hudson continued to examine the coast of Spitzbergen during many days, constantly attempting to make a passage to the northward, but always stopped by the ice. He gave the name which it still bears, to the N.W. point of Spitzbergen—Hakluyt Headland. At one time he found his latitude to be 81°, to the northward of Spitzbergen, when the land he sighted was probably the Seven Islands; he observed that the sea was in some places green, and in others blue, and he says, 'our green sea we found to be freest from ice, and our azure blue sea to be our icie sea.' Scoresby considers this to be accidental, and he ascertained the green colour to be caused by myriads of minute *medusæ*, 110,592 in a cubic foot.

Having completed the examination of the western side of Spitzbergen, which he describes as very high mountainous land, like rugged rocks, with snow between them, Hudson formed the magnificent design of sailing round the north end of Greenland, and returning to England by Davis Strait. With this object he again examined the sea between Spitzbergen and Greenland, towards the end of July, but judged, from the strong ice-blink along the northern horizon, that there was no passage in that direction. He, therefore, after sighting Spitzbergen, determined to return to England, and, on his way homewards, he discovered an island in 71° N. which he named 'Hudson's Tucthes.' There cannot now be any doubt that this island, discovered by Hudson, is the same as has since so improperly been called Jan Mayen, after a Dutch skipper, who, on very weak authority, is said to have seen it some years afterwards, in 1611. The island is about 30 miles long, by 9 miles broad, and at its northern end rises up the remarkable volcanic peak of Beerenberg, 6,870 feet high. The little 'Hopewell' was safely anchored in the Thames again on September 15.

The results of this voyage were very important, both in a geographical and a commercial point of view. Hudson had discovered a portion of the east coast of Greenland; he had examined the edge of the ice between Greenland and Spitzbergen twice, in June and in the end of July; and he had sailed to the northward of Spitzbergen, until he was stopped by the ice; reaching almost as high a latitude as Scoresby in 1806, which was 81° 12′ 42″ N. Hudson's highest latitude by observation was 80° 23′; but he sailed for two more days in a north-easterly direction. The practical consequence of Hudson's voyage was that his account of the quantities of whales and sea-horses in the Spitzbergen seas led to the establishment of a rich and prosperous fishery which continued to flourish for two centuries.

In 1608, Hudson fitted out a second expedition to attempt a passage between Spitzbergen and Novaya Zemlya. His crew consisted of fourteen hands. Robert Juet was the mate; and two of the men had sailed with Hudson in his former voyage, namely, John Cooke, now promoted to the rank of boatswain, and James Skrutton. John Hudson, the captain's son, was also on board. On April 22 they sailed from the Thames, and reached the edge of the ice, in latitude 75° 29′, on June 9. Hudson hoped to bore his ship through the pack, so he stood into it for several leagues, but found the ice ahead to be firm and thick, and was obliged to give up the attempt. He then sailed along the pack edge to the eastward, always keeping the ice in sight on his port beam, and watching for an opening until the 26th, when he reached the coast of Novaya Zemlya, in latitude 72° 25′ N. He had thus ascertained that the barrier of ice between Spitzbergen and Novaya Zemlya was impenetrable, as on his former voyage it had proved to be between Greenland and Spitzbergen. It was quite clear that for 'Search-thrifts,' 'Hopewells,' and such like craft, the portals of the unknown region were firmly closed. It remains to be seen whether a sharp-bowed screw steamer will be able to force them open. Stout Henry Hudson had failed, and his additional laurels were to be won elsewhere; but he had done all that the boldest mariner could do, with nothing but a little 'Hopewell' under his feet; and no explorer has done much more in the same direction, since that 25th of June 1608, when he sighted Novaya Zemlya, and turned his vessel's head to the south. As a Polar explorer we shall meet him no more. He examined a part of the Novaya Zemlya coast, and arrived at Gravesend on August 26. During this second voyage, Hudson observed numerous pieces of drift wood floating in the gulf stream, from the North Cape to latitude 75° 30′ N.

Hudson, as is well known, was foully murdered. It is pleasing to find that his services were acknowledged by the bountiful old East India Company. Mrs. Hudson was left very poor, and the Court gave an appointment to her son on board one of their ships, in the year 1614, because the brave father perished in the service of the Commonwealth.[1]

After the voyages of Hudson, the whale fishery commenced in the Spitzbergen seas. Captain Jonas Poole made four voyages for the Muscovy Company, in 1609, 1610, 1611 and 1612, for killing whales and morses. Horn Sound, and Bel Sound, in the south of Spitzbergen, still retain the names given by Poole; and, in 1612, he tells us that a skipper from Hull, named Thomas Marmaduke, went as far as 82° N.; two degrees beyond Hakluyt's Headland. Baffin was in the Spitzbergen seas with the whaling fleet in 1613, and in the two following years Robert Fotherby was sent up to make new discoveries, with Baffin as his pilot. In 1614,

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[1] 'Being informed that Mrs. Hudson, the widow of Mr. Hudson, who was left in the North-west discovery, desired their favour for employing a youth, a son of his, she being left very poor, and conceiving that they were partly obliged in charity to give assistance, in regard that his father perished in the advance of the Commonwealth, resolved to recommend him to the care of some one who is to go to the voyage.' (*April* 9, 1614.)

'Mrs. Hudson's son recommended to the care of Hunt, master's mate in the "Samaritan": five pounds to be laid out upon him in apparel and necessaries.' (*April* 19, 1614.)—*Calendar of State Papers, Colonial Series. East Indies.* 1513-1616, *paras.* 709 *and* 711.

Fotherby and Baffin, in the ship 'Thomazen,' sailed a few miles to the north of Spitzbergen, until they reached 80° and odd minutes;[1] and in the same year some islands to the eastward of Spitzbergen were discovered by four other ships belonging to the Muscovy Company. In 1615 Fotherby was despatched by Sir Thomas Smith to seek a passage to the northward, in the 'Richard,' of twenty tons. As usual they were stopped by the Polar pack near Hakluyt's Headland, and like Hudson before them, they examined the pack edge for a considerable distance to the westward, but could find no opening. Master Fotherby, however, was a man of a hopeful disposition, and though he could not deny that the sea between Greenland and King James his Newland (Spitzbergen), was much pestered with ice, yet he 'would not seem to dissuade this worshipfull Companie from the yearly adventuring of 150*l.* or 200*l.* till some further discoverie be made of the said seas and lands adjacent.' For the next century and a half we must seek for any further information respecting the Spitzbergen seas in the annals of the Dutch and English whaling trade; and several points of considerable interest, as throwing light on the border territory between the known and the unknown, may be obtained from these sources. They will be considered in the next chapter; but in the meanwhile it is necessary to give an account of a notable attempt to reach the North Pole, under the auspices of the Merry Monarch's Admiralty.

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[1] 'Purchas' iii. p. 466. This is all that we know of Baffin's voyage of 1614. Dr. Petermann, in a letter to the President R. G. S. dated Nov. 7th, 1874, says it is highly probable that, in this voyage, Baffin sighted the west coast of the land discovered by the Austrian Expedition in 1873. It will be seen that there is not the shadow of a reason for supposing anything of the kind.

Since Henry VIII. had sent divers cunning men to seek strange regions in 1527, the Government had taken no part in these northern voyages of discovery. But at last the Admiralty was warmed into action by the eager persuasions of a master's mate. John Wood had served as master's mate in the 'Sweepstakes,' under Sir John Narborough, during that officer's discreditable voyage to Patagonia and Chili, in 1669. Cloudesley Shovel, then in his twentieth year, and Grenville Collins, the future hydrographer, also served on board the 'Sweepstakes.' The master's mate was not a man to hide his light under a bushel. On his return he published 'Captian Wood's Voyage through the Streights of Magellan,' in which Narborough's name is not once mentioned, and, for all that appears to the contrary, Wood was commanding the expedition. In 1676 Mr. John Wood offered a plan to Charles II. and his brother the Duke of York, for discovery of a passage to the Indies by the North-East; the success of which he represented to be probable for the following reasons. He urged, in the first place, that the old Dutch navigators, Rijp and Barents, had always maintained that, by steering north-east from the North Cape of Norway, and keeping between Spitzbergen and Novaya Zemlya, at a distance from both, a sea free of ice might probably be found. This idea arose from the erroneous belief of the old navigators that ice could only be formed in the neighbourhood of land. Wood's second reason is that Hendrich Hamel, in his narrative of a captivity in the Corea, says that whales were found in the sea of Tartary with European harpoons in them. The rest of his argument is founded on absurd stories about Dutch whalers having sailed to and beyond the North Pole. His inducements to undertake the voyage were the honour of the king, the interests of his country, and want of employment at home, together with his aversion to an idle life. These arguments were irresistible to Mr. Samuel Pepys, then Secretary to the Admiralty, and Captain Wood was put in command of the 'Speedwell' frigate, with the 'Prosperous' pink, as a tender. Wood's old shipmate, Grenville Collins, went out as master of the 'Speedwell,' and the expedition sailed from England on the 28th of May 1676.

At noon on the 22nd of June, when on a meridian about midway between the North Cape and Novaya Zemlya, and in latitude 75° 59′ N., they sighted the edge of the Polar pack right ahead, extending E.S.E., and W.N.W. Wood then stood along the edge of the ice to the eastward, examining it carefully, and seeing many openings, which he sailed into and found to be bays. On the 26th he came in sight of Novaya Zemlya, and in the night of the 29th, the 'Speedwell' ran on a reef of rocks and became a wreck. Wood and his men went on board the 'Prosperous,' and arrived in the Thames on the 24th of August. In his letter to Nicholas Witsen, Grenville Collins says, that 'the proceedings of the voyage gave him full satisfaction that there was no passage between Greenland or Spitzbergen and Novaya Zemlya.'

The voyages of Hudson, Poole, Fotherby, and Wood, completed the examination of the whole extent of the Polar pack ice, extending from the east coast of Greenland to Novaya Zemlya; while Barents, until quite lately, was the sole authority respecting the state of the ice on the northern coast of the latter islands. All further information that can be gathered from the experience of whalers, and the narratives of modern expeditions, merely supplements the work of those intrepid navigators of the seventeenth century.

CHAPTER IV.

DUTCH AND ENGLISH WHALING VOYAGES IN THE SPITZBERGEN SEAS.

THE voyages of Hudson led the way to a great and flourishing whaling trade, in which many nations competed for pre-eminence, and which opened one of the most interesting chapters in the history of English and Dutch commercial enterprise. Henceforth, for more than two centuries, that part of the frontier of the unknown region which extends from Spitzbergen to Greenland, was annually frequented by fleets of whalers. The edge of the Polar ice, in this direction, is therefore well known; but as the main object of those who frequented it was connected with the slaying of whales and morses, and not with discovery, the increase to our information from the whaling annals is necessarily limited. Our chief concern with these voyages will rest upon the discussion as to the highest latitude that has been attained on the Spitzbergen meridians, and as to the state of the ice at the pack edge. There have been, however, several whaling captains who have observed carefully and systematically, and who have combined considerable ability and intelligence with scientific culture. Among them the name of Scoresby stands pre-eminent.

In the years following Hudson's first voyage the Muscovy and East India Companies sent ships to kill whales in the Spitzbergen seas, and after the voyages of Jonas Poole and Robert Fotherby, Captain Edge was the leading spirit in these whaling expeditions, which were set forth annually during the greater part of the reign of James I. The names of Richard Wiche, Ralph Freeman, Deicrowe, Heley, Barkham, and others, preserved in bays and straits, are those of the worthy merchant-adventurers who provided the means. In 1613 and 1614 the English whalers discovered Hope Island, and other islands to the southeastward of Spitzbergen.[1] In 1616 Captain Edge sent a pinnace to the eastward, to explore Edge Island, and other land on the east side, as far as 78° N. This pinnace was a boat of twenty tons, with a crew of twelve men. She is portrayed on the curious old chart of Spitzbergen in Purchas's 'Pilgrimes,' pulling up Stor Fiord. The pinnace's crew killed a thousand sea-horses on Edge Island, and got 1,300 tons (barrels ?) of oil by August 14. In 1613 the Dutch followed the example; and the Dutch and English seamen often came to blows over the exclusive right of the fishery. One of the English expeditions of this period discovered a large island to the eastward of Spitzbergen which was never visited again until three Norwegian sealing vessels reached it in 1872. As Dr. Petermann has endeavoured to throw doubt upon this English discovery, it is right to vindicate the claim of the bold adventurers of the Muscovy Company, by giving the particulars of their voyage. It is thus recorded in Purchas :—

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[1] These are the discoveries referred to by Purchas (iii., p. 466), as made by four ships in the year of Baffin's voyage, 1614.

'In the yeare 1617 the Company set out for Greenland fourteene sayle of ships, and their two pinnasses, furnished with a sufficient number of men and all other provisions fitting for the voyage, under the command of Thomas Edge . . . They employed a ship of sixtie tunnes, with twenty men in her, who discovered, to the eastward of Greenland, as far to the northwards as seventie-nine degrees, an iland which he named Wiches Iland, and divers other ilands as by the map appeareth, and killed store of sea-horses there, and then came into Bel Sound, where he found his lading of oyle left by the captayne, which he tooke in. This yeare the Hull men set a small ship or two to the eastwards of Greenland, for the Hull men still followed the steps of the Londoners, and in a yeare or two called it their discoverie, which is false, and untrue, as by oath in the Admiraltie doth appeare. The Dutch likewise practise the same course.'

Greenland was the name applied, in those days, to the Spitzbergen group. When Wiche Island was again sighted by Von Heuglin in 1870, Dr. Petermann discarded the old and true name of 'Wiche Island,' and re-christened it 'King Karl Land.' He did this on the ground that Wiche Island is stated to have been sighted from Stone's Foreland bearing east, and that, as there is no land in that direction, Wiche Island never had any existence; and also that it is incorrectly placed on an old chart, published by Purchas, as regards latitude. These pleas can be conclusively disposed of. As may be seen from the above extract, Stone's Foreland is not even mentioned; and there is no authority whatever for saying that the map in Purchas was prepared by or under the authority of Edge or any of his officers. But the account of the discovery, in the text of Purchas, settles the question. We are told that the discovery ship went as far north as 79°, the exact latitude of the large island named by Petermann 'King Karl Land;' which is thus proved, beyond any doubt, to be the Wiche Island discovered by the English in 1617. It was named after Mr. Richard

Wiche, an eminent London merchant, who was one of the founders of the East India Company.[1]

In subsequent years there were frequent collisions with the Dutch fleet, and the English found it more and more difficult to hold their own. Eventually, for many years, the trade fell almost entirely into the hands of the Hollanders.

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[1] Richard Wiche or Wyche was a merchant of London, of the Skinners' Company, and among the foremost of those patriotic adventurers who did so much to foster the commerce of England during the reigns of Elizabeth and James I. We find him in the list of undertakers of the first voyage to India, in 1599, when he subscribed 200*l.*, and undertook the contract for beans and mustard. The East India Company received their charter of incorporation on December 31st, 1599, when privileges for trading with India were granted by the great Queen to the Earl of Cumberland and 215 knights, aldermen, and merchants, including Richard Wiche, who was on the first committee of directors. Mr. Wiche also assisted in the formation of the North-West Company, in 1612, and was an active member of its committee when the whaling fleets, under Captain Edge, were despatched to the Spitzbergen seas. Hence the island in 79° N., east of Spitzbergen, discovered in 1617, was very appropriately named Wiche Island. Mr. Wiche married Elizabeth, daughter of Sir Richard Saltonstall, who was Lord Mayor of London in 1598, by whom he had twelve sons and six daughters. He died on November 20th, 1621, and was buried at St. Dunstan's in the East. His posterity did credit to the name of the worthy merchant-adventurer for several generations. One son, Sir Peter Wyche, was Ambassador to Constantinople and a Privy Councillor. His son (also Sir Peter) was Envoy to Muscovy in 1688, Resident at Hamburgh, and a Fellow of the Royal Society. At the request of the Royal Society he translated 'A Short Relation of the River Nile,' from the Portuguese, which was ordered to be printed by Lord Brounker, the President, in November 1688. A great-grandson of old Richard, Sir Cyril Wyche, was Envoy to Russia, created a baronet in 1729, and died in 1756. Another son of Richard Wiche probably settled at Haselbech, in Northamptonshire, and his descendants were lords of the manor of Haselbech for four generations. William Wiches, of Haselbech, was member for Northampton, and died in 1742.—*See Calendar of State Papers, Colonial Series. East Indies.* 1513-1616, *paras.* 256, 257, 267, 268, 273, 281, 288. *See also Stow's Survey of London.*

But during the time that the English mariners were in the ascendant in the Spitzbergen seas, from the voyage of stout Henry Hudson in 1607 to about 1622, they did excellent geographical work; which is shown on the chart of Purchas. Here we have the whole of the west and north sides of Spitzbergen, with their fiords and off-lying islets delineated and named, as well as part of the strait between the main island and North-East Land, called Sir Thomas Smith's Inlet, but which was afterwards named the Waygat or Hinlopen Strait, after a rich Amsterdam burgomaster of that name. We have North-East Land, called Sir Thomas Smith's Island. We have the whole of what is now called Stor Fiord by the Swedes; with the west and south sides of Edge Island, and Alderman Freeman's Inlet on its northern shore; and we have WICHE ISLAND far to the east, discovered by the English in 1617, but never seen again, or at least delineated on a map, until 1870.

Thus was the greater part of Spitzbergen fairly mapped by the English, and names given to the principal features. Some of those features were improperly named again by the Dutch, but the more ancient English names ought on all occasions now to be adopted, except, of course, those given by Barents, which have a prior claim. The old names should be restored on all new maps.

Commodore Jansen, of the Dutch Navy, makes the following interesting remarks on the Spitzbergen fishery of his countrymen: 'When our whalers first came to Spitzbergen, they met with the whales in great quantities, enjoying all the luxury of this most exquisite feeding ground, the best perhaps in the whole Arctic region. The whales were found sporting in open water off shore, with their huge backs above water, or taking their *siesta* in a calm bay, surrounded by abundance of food. This was a most glorious time for the whales—the paradise of their history. In spite of the yearly increase of whalers, and the great number of whales that were killed on the same spot, they always resorted to this favourite ground. During this first period, called the "Shore Fishery," we had an oil-boiling establishment at Smeerenburg, on Amsterdam Island, near the N.W. point of Spitzbergen. Every year our whalers went straight to this island; each vessel had six or seven boats, and a large complement of men, who were employed in killing whales, bringing them ashore, and making oil as fast as possible. Thousands and thousands of whales were killed, and at last, from about 1640-50, they ceased for a time to come at all to the west coast of Spitzbergen. As soon as the scarcity of whales was felt, the directors of the Dutch Whaling Company made great efforts to follow them to their place of retreat. Several ships were sent out on exploring expeditions, but they did not find any islands besides those round Spitzbergen, nor any whaling-ground as easy and profitable as Smeerenburg and its vicinity had been. It had been remarked that a great number of whales took their flight round the N.W. point of Spitzbergen to the east, and in that direction our whalers went in search of the whales that came no more to the vicinity of that horrible slaughter-place, Smeerenburgh. This new whaling-ground was called "*to the Eastward*," and the whale that was caught there differed from a similar black whale that took its flight to the west, in the ice-bearing southerly Greenland current. The ice between Spitzbergen and Greenland was called "*West Ice*," and the whales that retreated into it the "*West Ice Whales*." After the havoc at Smeerenburg this *West Ice Whale* became shy, cunning, wild, and sometimes desperate. The other whale was more abundant in unusual years, when the ice east of Spitzbergen drifted in great quantities, and with smaller and flatter floes, much lower down than in a common year. Such an unusual year, in which there was great abundance of this particular whale, was called a "*South Ice*" year. This *South Ice Whale* was not so shy and cunning as the *West Ice Whale*, which leads to the conclusion that the *South Ice* years must have been very unusual. I do not believe that any ship went to the east coast of Spitzbergen from the south, and I am sure that no ship has ever been in the east ice, between Spitzbergen and Novaya Zemlya, unless along the coast of Novaya Zemlya. In ordinary years, our whalers were obliged to go in search of whales in the *West Ice*, where many ships were lost, and in about 1650 the whaling business was made a free trade. Every year from 100 to 200 ships went along the Greenland ice up to Prince Charles' Island, on straight to 79° or 79° 30′ N., very seldom higher or lower, and steered from thence west, in the ice-bearing southerly current. In a *South Ice* year, however, they did not go so far north, but steered east as soon as they detected that it was such a year. The real ice-fields, 36 miles long, are found 224 miles west of Spitzbergen, and the whalers penetrated through loose ice until they reached them. They then drifted with the field down to 75°, and, if they had a full cargo, returned home. If not, they went back again to 79°, to make the same circuit again, or else they tried the whaling-ground to the eastward of Spitzbergen.

'Theunis Ys, one of the most experienced navigators in the seas near Novaya Zemlya, was of opinion that no vessel had been higher than 82°, owing to the large fields of ice which are nearly always found to the north of Novaya Zemlya, although no land can be seen. In 1664, Captain William de Vlamingh sailed along the north and north-east coast of Novaya Zemlya, round to the east, and reached the bay where Barents wintered in 1596, though he did not land there. From thence he sailed in an E.S.E. direction, in latitude 74″ N., and saw no ice, but here and there a floe. He also went in a N.W. direction from Novaya Zemlya, as far as 82° 10′, and in going to the north the water invariably became more and more smooth, and there was less and less current. The state of the sea, with reference to ice obstructions, depended on prevailing winds. Vlamingh was afterwards selected to command an exploring expedition to New Holland.'

But the most extraordinary Dutch voyage to the north of Novaya Zemlya is that recorded by Witsen.[1] He says:—'I am informed with certainty that Captain Cornelis Roule has been in 84½° or 85°, in the longitude of Novaya Zemlya, and has sailed about forty miles between broken land, and saw a large open water behind it. He went on shore with his boat, and from a hill it appeared to him that they could go three days more to the north. He found lots of birds there, and very tame.' No dates are given, but it appears that Witsen received the account when his work was in the hands of the printer (1705) and he had no time to make enquiries.

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[1] See Commodore Jansen's Paper, in the R.G.S. Proceedings ix. p. 178.

In the year 1624 a small Dutch vessel of eighty tons, and a crew of ten men, commanded by Captain Williamszoon, with Jacob Jacobszoon as steersman, attempted to sail to the Pole. They reached to 3° N. of Spitzbergen, and then sailed along the edge of the Polar pack, but found no opening in any direction. So the good skipper Williamszoon was convinced that it was impossible to come under the 'Polum Articum,' and he wisely returned to his whaling-ground. His attempt aroused a desire to make the discovery in others, and two captains named Sybrandt and Claas Corneliszoon tried their luck, but were equally unsuccessful. Toris Carolus, who himself made two voyages to the north, published his sailing directions in 1634, in which he stated that 83° N. was the highest latitude that had ever been reached.

It would seem, from the above notes, that the Dutch frequenters of Spitzbergen had made no material addition to knowledge of the group up to the end of the seventeenth century. They never went beyond the Seven Islands and Hinlopen Strait, on the north coast, and, in a bad year, they went round to the east, by doubling the south point of Spitzbergen, and proceeding to a great fishery in Disco Bay, off Edge Island. This is quite clear from what Frederick Martens tells us, who went to

Spitzbergen in 1671,[1] and wrote the best account of the group previous to the publication of Scoresby's work. He says: 'Then follow the Seven Islands. We saw no ships go any further, neither could I understand that ever any ship did go further, nor can they go so far every year towards the east, because of the danger of the ice. It is unknown whether the Waygat goeth through the country or no.'

But about thirty-five years after the time of Martens, two Dutch captains, named Cornelis Gilies and Outsger Rep, made voyages to the eastward, such as have never been equalled up to the present day. Captain Gilies, in 1707, passed more than a degree to the northward of the Seven Islands without any hindrance from ice, then sailed east for some leagues in an open sea, then bent his course south-east, and afterwards south. In latitude 80° N. he saw very high land about 25 miles to the east from North-East Land, which has since been known as Gilies Land. He then ran along the east side of North-East Land, entered Hinlopen Strait, and anchored in Lomme Bay, where he took two whales. This information was collected from Walig and other whaling captains at Helder, in 1775, and is given by Daines Barrington.[2] It exactly agrees, in all respects, with Van Keulen's chart. Thus the Dutch ascertained that the two inlets discovered and named by the English after Sir Thomas Smith and Alderman Freeman, were in reality straits, and they called them Hinlopen and Walter Tymens respectively. The Dutch also discovered the Seven Islands, the east coast of North-East Land, Gilies Land, and three islands off the east-coast of Edge Island, which were named Rijk Ys Islands. But they never saw the Wiche Island of the English, farther east, and that land was so clean forgotten, that both Scoresby and the Captain of the 'Recherche,' in their maps, put '*Wiche Land*' as another name for the Rijk Ys Islands.

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[1] Published by the Hakluyt Society in their volume for 1855.

[2] It appears, from the list of whaling captains, by Gerret Van Saute, that Cornelis Dirkzoon Gilies made voyages to Spitzbergen

The Dutch knowledge of Spitzbergen is embodied in the chart of the Van Keulens (father and son), which went through several editions, and was the best authority on the subject throughout the

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from 1700 to 1714, in a ship belonging to the town of Jhisp, in North Holland. His most successful year was 1705, when he got sixteen whales. In 1707 he seems to have sacrificed whaling for discovery; for, according to the list, he got no whales in that year. In the fourteen years he caught 122 whales. Outsger Rep is probably the Outsger Pieterszoon Rep of the list, who made voyages from 1700 to 1702 only, so that his discoveries cannot have been in the same year as those of Gilies. (See *Alphabetische Naam-lyst van all de Groenlandsche en Straat Davissche Commandeurs, door Gerret van Saute. Haarlem*, 1770.) Walig, who furnished the information respecting the voyage of Gieles, is the Jan Simonszoon Walig of the list. He made thirty-one voyages to Spitzbergen, from 1714 to 1746, and used the charts prepared by Gieles.

eighteenth century. John Van Keulen, the father, died in about 1705, and the son, Gerhard Van Keulen, issued his last publication in 1728. The last edition of their Spitzbergen chart was published after the return of Captain Gilies and Outsger Rep, and shows their discoveries. (Their names are on its title.) Dr. Petermann has written rather disparagingly of Van Keulen's chart, and has altered the position of Gilies Land from 80° to 81° 30′, referring to Barrington as his authority. But the account in Barrington agrees exactly with Van Keulen's chart,[1] and with the bearings taken by Tobiesen in 1864, so that the alteration is certainly a mistake. Mr. Foster, who was one of the lieutenants in Parry's expedition of 1827, gives a very different estimate of the value of Van Keulen's work. He says: 'We recognised distinctly almost every feature of the lands delineated in the old Dutch chart,' and he adds that several of the glaciers in Hinlopen Strait were faithfully laid down.

The Dutch whale fishery continued to flourish during the period that the gallant little Republic maintained its maritime greatness. The statistical returns are given from 1669 to 1775, from which it appears that between 1675 and 1690 over a hundred ships annually made the Spitzbergen voyage, in one year (1684) the large number of 242 vessels having sailed. From 1672 to 1674 the war put an end to the fishery for a time, and again in 1691. The average loss of ships was 10 every year, and in 1678 as many as 18 were wrecked. After 1691 the number of whalers fell off. In 1700 there were 173, in 1707 the number that sailed was 131, and in 1717 there were 194. In 1769 there were 110, in 1775 the number fell to 88, and from that year the fishery gradually fell off, until it was finally extinguished at the breaking out of the French revolutionary war. The chief authority on the whale fishery of Holland, the Dutch Scoresby, is Zorgdrager, a daring skipper as well as an author, who made voyages in a ship belonging to Zaandam, from 1700 to 1705.[1]

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[1] See p. 49.

Thus the whaling trade of the Hollanders gradually came to an end in the last half of the last century. Many names round the Spitzbergen shores, and great numbers of graves remain as memorials of their former hardihood. Treurenberg, the great bay on the northern coast, is from *treuren*, to mourn; and Parry found numerous Dutch graves on every point, with dates from 1640 to 1738. It is a pity that the Dutch should not resume their Spitzbergen enterprises, and, reviving the memory of former achivements, once more take their place among Arctic explorers. Surely the countrymen of Barents, of Vlamingh, and of Linschoten, have the old spirit left among them, and are ready to assume their rightful part in the same rank with the explorers of other countries, who are now gathering and marshalling their forces for an onslaught upon the vast unknown Polar region.

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[1] *Cornelis Gysbertszoon Zordragers Groenlandsche Visschery. Amsterdam,* 1720. 4*to. pp.* 330, *with maps and illustrations.* See also a valuable recent prize essay on the same subject:—*Geschiedenis der Noordsche Compagnie door Mr. S. Muller, Fz. Uitgegeven door het Provinciaal Utrechtsch Genootschap van Kunsten en Wetenschappen. Utrecht,* 1874.

Mr. Daines Barrington, who, in 1773, took great pains to collect every story he could pick up connected with this subject, gives six instances of Dutch vessels having been alleged to have nearly reached the Pole. They are all, however, so obviously fabulous that it is astonishing how any sane man could have been found to give credit to them. The first is supplied by one Dallie, who told Dr. Campbell (the editor of Harris' 'Voyages') that, fifty years before, he went in a ship to 88° N., where the weather was warm, and there was no ice. Dr. Campbell told the story to Mr. Barrington thirty years afterwards. The second came from a Hollander, who once swore to a Mr. Grey that he had been to 89° 30′ N.; and Mr. Grey told the story to Mr. Oldenburg in 1663. The third is from a Mr. Wheatly, who had been told by three Dutch skippers that they had heard of a Dutch ship having been in

89° N. The fourth is from a Mr. Reed, who told Mr. Barrington that, fifteen years before, he had himself been told by one Hans Derrick,[1] that he had been in 86° N. with five other ships. The fifth instance is given by Captain John Wood, as his fifth reason for believing that he could sail to the North Pole. It is supplied by a Captain Goulden, who is said to have told the King in 1676 that he had heard from two Dutch skippers, twenty years before, that they had been in 89° N. They added, that four journals were kept on board the two ships, and that they agreed within four minutes.

But the sixth instance is the most absurd of all, although the authority for it is no less a person than Mr. Moxon, the hydrographer to the King's most excellent Majesty.

It appears that about twenty-two years before Mr. Moxon told the story, or in 1654, the credulous old gentleman went into a drinking house at Amsterdam to drink a cup of beer, and sat down by the public fire, among several other tipplers. Presently a sailor came in, and, seeing a friend over his beer, whom he supposed to be with the Greenland fleet, he enquired what accident brought him home so soon. 'Oh!' said the beer-drinker, 'we sailed to the North Pole and back.' This startled worthy Mr. Moxon, who joined in the conversation, asking if the statement was really true. Upon which the wag replied that he had not only been to the Pole, but 2° beyond it; and then the Dutch sailors evidently resolved to see how much the stranger could swallow. In answer to his questions, they told him that there was a free and open sea round the Pole, that they saw no ice, and that the weather was as hot as at Amsterdam in summer. At last the hydrographer thought that, as they were engaged in discourse with each other, he could not in modesty interrupt them longer; but he believed the Dutch sailor 'spoke matter of fact and truth, for he seemed a plain, honest and unaffectatious person, and one who could have no design upon me.'

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[1] A Hans Dirkszoon made voyages in a vessel from Krimpen, between 1753 and 1769. See *Alphabetische Naam-lyst, &c., p.* 49.

This conversation was gravely written out, and published with a map, some silly arguments to prove the truth of the ale-house chaff, and a still sillier story to cap the whole. It found many readers, and a second edition appeared in 1697.

When Mr. Barrington asked the Dutch skippers themselves, he got the simple truth from them. In reply to his enquiries, they said, 'We can seldom proceed much higher than 80° 30′ N., but almost always to that latitude.'

The most flourishing period of the English fishery in the Spitzbergen seas was from 1752 to 1820. Bounties of forty shillings per ton were granted by Act of Parliament, and from 1733 to 1785 the sums paid in bounties amounted to 1,266,430*l*. The quantity of shipping thus employed increased rapidly and in 1778 as many as 255 sail of whalers were employed in the Spitzbergen seas. As they usually ranged as high as 80° and 81° N. latitude, and as many of the whaling captains were not very accurate observers, there were numerous statements of vessels having gone still farther north, and all these stories were industriously collected by Mr. Barrington. But the English statements were far more modest than the Dutch, and 84° 30′ was the highest latitude that was ever mentioned in them. Yet they were nearly all given from memory, either by voyagers who had themselves made the observations, or by others who had had intercourse with them. In the former case more than half were from oral testimony, given at a distance of eighteen to thirty years from the time when the respective voyages were performed.

The Polar pack drifts south during the summer and autumn, and no navigator has ever alleged that he has actually bored through it. The edge of this pack varies its position in the different seasons, in the Spitzbergen meridians. Sometimes it is close down upon Hakluyt Headland; at others it is much farther north: possibly in very extraordinary seasons it may not be met with before even the 83rd degree is reached. But wherever it may be, it is quite certain that no vessel has ever yet sailed beyond its edge, and in this way, in remarkable seasons, some may have been in 81°, 82°, and even 83°. Yet there is no really authentic instance of any vessel having been north of 81° 42′, the latitude attained by the Swedes in 1868.

The whalers received an inducement to push to the northward whenever there was a good opportunity, from the reward offered for attaining very high latitudes; and we may be well assured that if any vessel had succeeded, the proofs of such a voyage would have been forthcoming. In 1776 a reward of 5,000*l.* was offered to the first person who should sail beyond the 89th degree of latitude (Act 16 Geo. 3, cap. 6). In 1818 the inducement was made more tempting by a revision of the former Act, and an arrangement by which proportionate rewards were offered for partial success. (Act 58 Geo. 3, cap. 20.) By the new Act the first ship that sailed to 83° N. was to receive a reward of 1,000*l.*, to 85° N. 2,000*l.*, to 87° N. 3,000*l.*, to 88° N. 4,000*l.*, and to 89° N. 5,000*l.* It is satisfactory to find that this excellent law has not been repealed in the recent Acts of Parliament, which have swept away a vast number of old Acts (24 and 25 Vic. cap. 101, and 26 and 27 Vic. cap. 125).

Although the whaling voyages have not done much towards an extension of our knowledge to the northward, yet to the great work of Scoresby, and to the careful observations of himself and his father, we are indebted for the most useful account of the Spitzbergen seas, and of the ice in them, up to the edge of the Polar pack.

Dr. Scoresby found that the edge of the ice, during the winter and early spring, extended in a line from the east coast of Greenland to the northward of Jan Mayen Island, crossing the meridian of Greenwich between the 71st and 72nd degrees of latitude, according to the year, then passing up north for several degrees and leaving a bay, and finally stretching away east to Novaya Zemlya. The deep bay thus left to the eastward of the Greenwich meridian, which is probably caused by the Gulf-stream, forms the route by which the whalers proceed to their fishing-ground, and is called the 'Whale-fisher's bight.' When the ice in the spring extends from the head of this bay to Spitzbergen, it is called a *close season*; and when navigation is open along the west coast, as far as Hakluyt Headland, it is an *open season*. In an *open season* a large channel of water lies between the land and the ice, from 20 to 50 leagues in breadth, as far as 79° to 80°, where the ice generally closes round again, and touches the islets to the northward of Spitzbergen; but even in an *open season* the ice appears again on the east side of Spitzbergen, and extends thence to Novaya Zemlya. In a close season there is a barrier of pack-ice extending from the south side of Spitzbergen, and the whalers enter it without hesitation, and persevere in boring their way through it until the open water on the other side is reached.

Such is the usual state of the ice when the whalers first approach it in April: but by the end of June all obstructions so far south have disappeared. It is, however, very remarkable, that while, on the west side of Spitzbergen, the ocean is annually navigable on the meridians of 5° to 10° E. to the 80th degree of latitude, in all other parts of the distance from Greenland to Novaya Zemlya the pack is usually met with in the 74th or 75th degree. This, no doubt, is caused by the Gulf-stream, and by the set of the current from the N.E., which drives the ice on to the N.E. side of Spitzbergen, while a navigable lane is opened on its western shores. In the summer the line of the Polar pack extends from about the 80th degree in the meridian of Spitzbergen, in a S.W. direction, to the 74th or 75th degree on the east coast of Greenland. The Spitzbergen coast presents a line of mountainous peaks, ridges, and needles, rising from the sea to a height of 3,000 and 4,000 feet, and the intervening valleys are filled with glaciers, which occasionally send off small icebergs; but they are neither numerous nor bulky. The ice which drifts from the Polar region in the form of extensive fields, begins to appear in the Spitzbergen seas in May and June, and is of most formidable character. These fields are often 30 miles broad and 100 in length. They are 10 to 15 feet thick when flat, but when pressed up and hummocky their thickness is often as much as 40 to 50 feet. Scoresby says they are not unfrequently in single sheets of solid transparent ice, near 40 feet in thickness. They drift away to the S. and S.W., and when they come in contact with each other the pressure is fearful, a noise is heard like long resounding peals of thunder, and ridges of broken-up ice rise high up into the air. Numbers of vessels have been destroyed by the pressure between two fields, and when large fleets frequented these seas as many as twenty-three have been lost in a single season.

All the speculations of early navigators on the possibility of reaching the Pole were founded on the false idea that ice was only formed in the neighbourhood of land, and never in the open sea. Scoresby, however, found that ice was formed in the Spitzbergen seas during nine months of the year; and that neither calm weather nor the proximity of land were essential for its formation. The land does not afford any assistance, nor even shelter that cannot be dispensed with during the operation of freezing; and Scoresby often saw ice grow to a consistence capable of stopping the progress of the ship, with a brisk wind, even when exposed to the waves of the Atlantic. Dr. Walker, of the 'Fox,' gives the temperature at which the surface freezes in Baffin's Bay at $28\frac{1}{2}$°. Dr. Kane found it to be 29° in Smith Sound.

The most interesting voyage to the far north, performed by an English whaler on the Spitzbergen meridians, is that recorded of the 'Resolution,' commanded by Captain Scoresby, in 1806.

They entered the ice, in the good ship 'Resolution,' on April 28, in latitude 76° N., and found it to be of extraordinary width and compactness. The elder Scoresby pressed into ice which, to ordinary apprehension, was impenetrable. But now was shown the value of experience and intelligence. The experienced eye of the veteran ice navigator alone discerned indications of open water to the northward. There was a strong 'ice-blink' along the northern horizon which, to all minds on board but one, precluded hope. But Scoresby, narrowly scanning this 'ice-blink' from the main-topmast head, discerned a blueish grey streak *below* the 'ice-blink,' and closely skirting the horizon. He knew this to be an indication of water beyond the pack, yet it might merely be a transient lane or pool, and of no extent. But the watchful veteran detected another sign. He perceived occasionally a very light motion of the water in contact with lumps of ice near the ship. He knew that this could only arise from a distant swell, which must proceed from an open sea either to the south or north. The distance he had penetrated into the ice, and the unmixed 'ice-blink' astern, convinced him that it did not come from the south. With conviction came the resolution to push on through the formidable body of consolidated ice still before him. Every effort was made, boats were hoisted and lowered to break the ice ahead; channels were cut with ice-saws; the crews towed, tracked, and sallied the ship by running in a body from one side to the other. At length, in 80° an open sea was reached. It was bounded on the north in about 81° 30′ by the solid Polar pack, but was 50 or 60 miles wide, and extended for an unascertained distance from E.N.E. to W.S.W. The fact was that, from reasons due probably to prevailing winds, a great mass of ice had broken off from the main pack, and drifted south very early in the spring, before the main pack began to move, thus leaving this broad open lane, which would of course disappear when the main body began to move latter in the season. Meanwhile Scoresby sailed across it to the edge of the northern pack, taking several whales; and, at midnight on the 24th of May, a careful observation gave him a latitude of 81° 12′ 42″ N. Next morning his latitude by dead reckoning was 81° 30′ N. in 19° E., where the ice was fixed and solid to the north, but there was open sea from E.N.E. to S.E., with a water sky.

The whalers have made us familiar with the nature of the ice between the east coast of Greenland and Spitzbergen, and the valuable works of Scoresby supply the best and most interesting mass of information respecting all the phenomena of the Arctic region that has yet been published. His strong desire to render his observations useful to science, as well as to the practical navigator, induced him to go through a special course of study, and he thus set an example which in many instances has since been followed, and has led to results which reflect the highest honour on the mercantile marine.

At present the whaling fleet, from Dundee and Peterhead, proceeds to the edge of the ice in the months of February and March, which then extends from Jan Mayen Island in a north-easterly direction, to kill seals.

In February and March of 1874, there were 46,252 seals killed at the edge of the ice, yielding 577 tons of oil; the value of which was 20,195*l.*; besides the 46,252 skins, averaging 4*s.* 6*d.* each, or with a total value of 10,401*l.* So that the total value of the seal fishing for 1874 was 30,601*l.*

The ships return in May, and most of them then proceed up Baffin's Bay for the whaling. A few only, sailing from Peterhead, now frequent the Spitzbergen seas in the summer, which are thus left to the Norwegian sealing fleet.

CHAPTER V.

THE SPITZBERGEN ROUTE—TCHITSCHAKOFF—PHIPPS—BUCHAN—CLAVERING—LUTKE.

During the last hundred years several Government expeditions, sent by Russia, England, Sweden, and Germany, have examined the pack edge between Greenland and Novaya Zemlya. The lead was taken by the Russians.

The Russian plan was to form a depôt in Bell Sound, on the coast of Spitzbergen, where five houses were erected by Lieutenant Nemtinoff in the summer of 1764, and where stores were landed; and thence to push through the ice, if possible, to the Pacific. Three ships (the largest 90, the two others 72 feet long) were built by an Englishman named Lambe, at Archangel, and on May 9, 1765, the expedition sailed under the command of Captain Vassili Tchitschakoff. He found the west coast of Spitzbergen blocked up with an unusual quantity of ice, with which he continued to do battle during two months; but could never reach higher than 80° 26′ N. He returned to Archangel, and was sent with the same ships to make another attempt in the following year, sailing on May 19. He again found an impenetrable barrier of heavy ice north of Spitzbergen, and after attaining a latitude of 80° 30′ N. he gave the matter up as hopeless. A party of Russians had twice wintered at Bell Sound in charge of the stores, during the progress of these unsuccesful attempts to penetrate to the north.

In England, the idea of Polar discovery was revived by Mr. Daines Barrington, who assiduously collected every scrap of information from Dutch and English whalers on the subject, and read a series of papers before the Royal Society. In the beginning of February 1773 he induced that body to submit a proposal to the King for an expedition to try how far navigation was possible towards the North Pole; and 'orders were given that it should be immediately undertaken, with every encouragement that could countenance such an enterprise, and every assistance that could contribute to its success.' The 'Racehorse' and 'Carcass' bombs were fixed upon as the strongest of His Majesty's ships, and as best adapted for the service, and Captains Phipps and Lutwidge appointed to command them. One of the volunteers was Horatio Nelson;[1] and when those who cannot comprehend the value of their scientific results question the utility of Arctic expeditions, they may well be told that the education received in voyages of discovery in the ice conduces to the formation of naval character, and that the Polar pack taught lessons which bore fruit off Cape Trafalgar.

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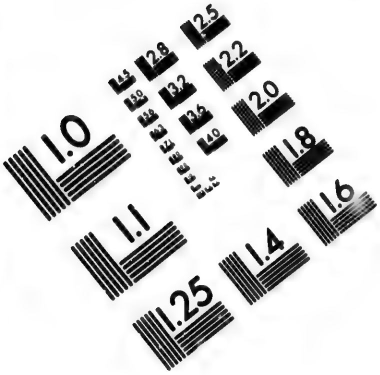
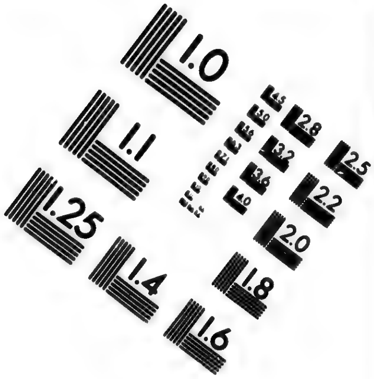
[1] Entered as captain's coxswain on board the 'Carcass.'

The expedition sailed from the Nore on June 2, 1773, and sighted the coast of Spitzbergen on the 28th. The two ships were stopped by the ice off Hakluyt Headland as usual, and attempted a passage to the westward; but the ice was quite fast in that direction, and a westerly course was given up after they had reached 2° E., in latitude 80° 36′ N. Captain Phipps then stood into every opening he could find to the northward; but was soon stopped, at every attempt, by solid fields of ice. There was a great swell from the south-west. During the last ten days of July, Captain Phipps continued to search for an opening along the pack edge, running into all the bays, going round every point of ice, and forcing the ships by press of sail as far as possible through the loose pack. Captain Lutwidge, from the top of a high mountain on one of the Seven Islands, saw one continued plain of smooth unbroken ice for a distance of twelve leagues to the east and north-east, bounded only by the horizon.

Soon afterwards a midshipman named Walden was sent to land on an island to report upon the state of the ice, and Captain Phipps named it Walden Island. This was on August 6. The ice at the pack edge was 24 feet thick, when they attained their highest latitude in 80° 48′, north of the central part of the Spitzbergen group; and their most easterly point, on August 7, was 20° E., near the Seven Islands, where the ice, in heavy fields and floe pieces, closed round until it rested upon the north-east island of Spitzbergen. They had thus examined a line extending over twenty degrees of longitude, and had found no opening in the Polar pack in any direction. It was quite evident that no passage was to be found north of Spitzbergen; and the expedition returned to England in September, after having made a very careful and persevering examination of the ice, and having attempted to bore through it at every point that offered the remotest change of success. Captain Brook surveyed the northern coast of Spitzbergen in 1807.

It was generally supposed, however, that Captain Phipps went out in a peculiarly unfavourable season; and when, in 1817, the whalers brought home accounts of a remarkably open sea, it was resolved that another attempt should be made. Captain Buchan, who had recently returned from an expedition into the interior of Newfoundland, was selected as the commander of this new and final assault upon the hitherto impenetrable barrier. Two old whalers, named the 'Dorothea' (370 tons), and the brig, 'Trent' (250 tons), were bought, provisioned for





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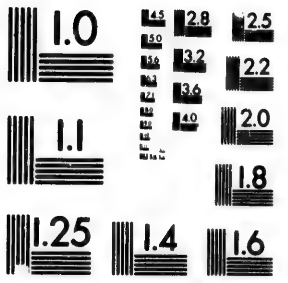

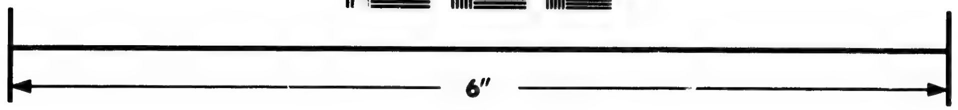

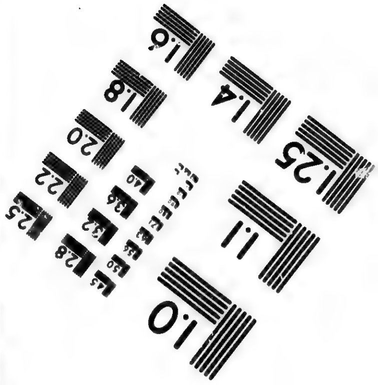

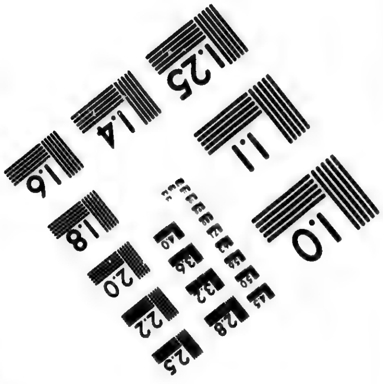

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two years, and commissioned—the former, by Captain Buchan, the latter by the gallant Franklin, then a lieutenant. The late Admiral Beechey, and that veteran Arctic explorer, Sir George Back, served on board the 'Trent.'

The expedition left the Thames on April 25, 1818, and a leak in the 'Trent' was almost immediately found to increase to an alarming extent. Its cause, a bolt-hole having been left open, was not discovered until they were in the ice. In May, the 'Dorothea' and 'Trent' were stopped by the main pack in latitude 80°, and took refuge in Magdalena Bay, at the north-west corner of Spitzbergen. Early in June they again put to sea, and were driven into the pack by a heavy swell from the south, where they were beset in the very position that all other expeditions from the time of Hudson had been stopped. On again examining the edge of the ice, early in July, a channel was found, which both vessels entered under full sail; but it soon came to an end, and the vessels were again beset by the close pack. Desperate efforts were made to bore through the ice, the men dragged the vessels along whenever the slightest opening occurred, all sail was set, and in this way they at last reached their highest latitude, in 80° 34′ N. But the whole body of ice was drifting south, and after strenuous exertions, by warping and dragging, they found they had actually lost twelve miles of northing at the end of the day. During this time both vessels experienced some very severe nips. The ice was 15 feet thick, and was often piled up above the bulwarks. The 'Dorothea' especially sustained serious injury. At this time they had penetrated for thirty miles within the pack, and it took them ten days to get back to the open water to the southward, thoroughly convinced that nothing more could be done on the Spitzbergen meridians. Captain Buchan then determined to examine the pack edge in the direction of Greenland, and on July 30 the two vessels were caught in a furious gale of wind, which drove them to take refuge in the pack again. The 'Dorothea' sustained so much damage from her encounters with the ice—so many of her beams were sprung and timbers broken—that it became necessary to abandon the enterprise and return to England. The expedition of Buchan effected the examination of about the same extent of the pack edge as was accomplished by his predecessor Phipps, sailing along it from 10° E. to 10° W.; but both found the barrier equally impenetrable.

The voyage of Clavering and Sabine in the 'Griper' (gun-brig), for the purpose of making pendulum observations, resulted in a further examination of the edge of the pack between Greenland and Spitzbergen. The 'Griper' sailed from the Nore on May 11, 1823, and anchored in a Spitzbergen harbour near Hakluyt Headland, on June 30, where Captain Sabine landed with his instruments. While the pendulum observations were in progress, Captain Clavering determined to examine the ice, and, getting under way on July 5, sailed due north from Cloven Cliff for twenty-five miles, and found the pack edge extending east and west as far as the eye could reach, in latitude 80° 20′ N. He then examined the ice to the westward for sixty miles (to 11° W.); but found it closely packed, and no opening in any direction. In the end of July, the 'Griper' sailed for the east coast of Greenland.

While these renewed efforts were being made to penetrate the icy barrier between Greenland and Spitzbergen, the Russian Government was prosecuting similar researches between Spitzbergen and Novaya Zemlya. These researches were conducted by Admiral Lutke, who was employed in surveying the coast of Novaya Zemlya from 1821 to 1824. In 1821 he examined the west coast of Novaya Zemlya as far as 74° 45′ N., where it was free from ice. In 1822 he got as far as Cape Nassau, in 76° 35′ N., in August, but found the ice accumulated there to such an extent that it was impossible to proceed farther. An attempt to round Cape Nassau in the same month was equally unsuccessful from the same cause. In 1824 he sailed with orders to attain as high a latitude as possible, at a distance from the coast. He arrived at the edge of the Polar pack in latitude 75° 30′ N., and examined it to westward as far as 43° 49′ E. longitude (in latitude 76° 5′ N.) whence he saw it still stretching away to the westward.

Thus, while Hudson, Poole, Fotherby, Tchitschakoff, Phipps, Scoresby, Buchan, Clavering, and many hundreds of whalers had carefully examined the outer edge of the mighty Polar pack to the north of Spitzbergen, the voyages of Barents and other Dutch seamen, of Hudson, Wood, and Lutke effected the same object between Spitzbergen and Novaya Zemlya. Hudson in one direction, and Buchan in the other, made very gallant but fruitless endeavours to bore or force their way through the close pack of stupendous floes and fields of ice.

A great mass of experience had sufficiently proved the impracticability of sailing to the North Pole; and it occurred to those two most eminent of our Arctic worthies, Sir John Franklin and Sir Edward Parry, that the true way of effecting this most important and interesting exploration was by means of travelling with sledges over the ice. Thus was the only efficient method of Arctic exploration at length suggested by the two highest of Arctic authorities. Parry, as it turned out, was wrong in the route he took, and in the time of year he selected for his journey; but he laid the foundation of that thorough system of Arctic investigation by means of sledges which has since borne such rich fruit, and which has been brought to perfection by the genius of Sir Leopold M'Clintock. The exploration of fifty miles of coast by M'Clintock and one of his sledge parties is worth more to science than the discovery of 500 miles by a ship. In the one case the coast is accurately laid down, and the nature of its fauna, flora, geology, and physical characteristics is fully ascertained. In the latter, a coast is seen and very inaccurately marked by a dotted line on a chart, and that is all. Until the art of sledge-travelling was discovered, Arctic exploration was in its infancy.

Parry's proposal to attempt to reach the Pole, by means of travelling with sledge-boats over the ice, or through any spaces of open water that might occur, was approved by the Admiralty, and on April 3, 1827, he sailed in the 'Hecla,' with the intention of making the attempt on the meridian of Spitzbergen. After rounding Hakluyt Headland, the 'Hecla' attained the very high latitude of 81° 5′ N., with nothing but loose drift ice to the northward, and no appearance of the main pack. This was on June 14. But Parry's object was to reach a secure harbour, and not to press to the northward in his ship; and he at last succeeded in finding a good anchorage for the 'Hecla,' in a bay which was called Hecla Cove, on the northern shore of Spitzbergen—79° 55′ N. and 16° 53′ E.

Then commenced that bold and interesting attempt, which, though unsuccessful, has supplied future explorers with information of great value, and which should excite in them a spirit of generous emulation. The 'Hecla' was safely moored in the cove which bears her name, and left under the command of Lieutenant Crozier, the future colleague of Ross in his Antarctic voyage, and of Franklin in his grand but fatal discovery of the North-West Passage. On a fine afternoon on June 21, with the temperature four degrees above freezing, the two boats, the 'Enterprise' and 'Endeavour,' were manned, and started for the North Pole. Parry himself, with Mr. Beverley, was in the first, while James Ross and Edward Bird officered the second. Ten blue-jackets and two marines formed the crew of each boat. The boats were flat-bottomed, with the extreme breadth of 7 feet carried well forward and aft, 20 feet long, with timbers of tough ash and hickory. On the outside of the frame, a new system of planking was adopted, in order to secure elasticity in the frequent concussions with the ice. It consisted first of a covering of waterproof canvass, coated with tar, then a thin fir plank, then a sheet of felt, and lastly, a thin oak plank, all secured to the timbers by iron screws. On each side of the keel there was a strong runner shod with metal, like that of a sledge, on which the boat entirely rested when on the ice. A hide span, across the fore part of the runners, had two horsehair drag-ropes attached to it. The boats had two thwarts, a locker at each end, a light framework along the sides, for containing provisions and spare clothes, a bamboo mast and tanned duck-sail, fourteen paddles, and a steer-oar. They started with seventy-one days' provisions. The weather was calm and clear, and as they paddled past the Seven Islands, the prospect looked very favourable, with loose sailing ice ahead; but on the 23rd they came to the close pack, and were obliged to haul the boats upon a floe in 81° 12′ 51″ N.

The travelling operations then commenced. The weight of each boat was 1,539 pounds, and the total weight, with provisions, 3,753 pounds, or 268 pounds per man, besides four light sledges weighing 26 pounds each. The daily allowance for each man was, ten ounces of biscuit, nine of pemmican, one of cocoa, and a gill of rum. They slept in the boats, with the sails as awnings, and travelled during the night.

Parry's journey was one of the most laborious and disheartening that can be conceived, and required an astonishing amount of resolute determination both in officers and men. The season was of a most exceptional character. More rain had fallen than during seven previous summers taken together, and the great Polar field-ice, generally met with in

80° or 81°, had not even begun to drift south. Thus the travelling was over the loose pack, which was broken into small pieces, and was rotted and decayed, by the unusual rainfall. The floes were of small extent, and intersected by high ridges of hummocks; and the men had to make three and sometimes four journeys, with the boats and provisions; while the pools of water which divided them, necessitated the constant launching and hauling up of the boats. The rain had caused large pools of water knee-deep on the floes, the snow was soft and heavy, and in many places there were large patches of what the men called 'penknife ice.' This is composed of innumerable needle-like crystals placed vertically close together, from 5 to 10 inches long, and pointed at both ends. Parry describes it as looking, at a distance, like green velvet, and he fancied it must be caused by heavy drops of rain falling downwards through the ice. It was not until July 7 that they reached a level floe; and on the 11th they found the ice becoming much heavier, with ridges of hummocks from 30 to 40 feet high, from the summits of which nothing but ice was to be seen in any direction. On the 20th they hauled over a floe about half a mile long, 15 to 20 feet thick, with huge hummocks at the margin, indicating a tremendous pressure at some time or other. Between the heavy floes there was bay ice, only two or three feet thick, which had formed during the previous winter in the interstices of the pack. On the 22nd they came to floes three miles square, and fifteen to twenty feet thick, and here at last they seem to have been getting near that heavy Polar pack which every other expedition had met with, when in sight of the northern shores of Spitzbergen.

But it was tôo late. August was approaching, and the southerly drift of the ice was increasing to such an extent that they lost by drift almost as much as they gained by many hours of laborious and fatiguing work at the drag-ropes. The southerly drift exceeded four miles a day. It was useless to continue such fruitless exertions, and Parry at last determined to retrace his steps. His highest latitude was reached on July 23, and was found to be 82° 45′ N. From this point there was a strong yellow ice-blink always overspreading the northern horizon, showing that the Polar pack was still stretching away far to the northward; for the yellow tinge denotes field-ice. They were now 172 miles from the 'Hecla,' but they had travelled over 292 miles of ground—200 by water before reaching the ice, and ninety-two over the loose pack. The boats returned to Hecla Cove, after an absence of sixty-one days, on August 21; and the 'Hecla,' sailing a few days afterwards, arrived in the Thames on October 6. Parry saw no sign of land from his extreme northern point; but there was mud in some holes in the ice, in latitude 82° N. Parry saw distant high land to the east of the Seven Islands, which must no doubt have been Cape Platen, on North-East Land, and the islands of Outsger Rep, Charles XII., and Broch and Foyn to the north-east of it, the last two discovered by Mr. Leigh Smith in 1871. Lieutenant Foster surveyed a part of Hinlopen Strait, as far south as 79° 33′ N., and gave the names of Cape Fanshawe and Foster Islands to a point of land and a small group in that strait, at his farthest point.

By this noble attempt Parry, in spite of all the obstacles and difficulties which opposed his progress, attained the highest latitude that has ever been reached, of which there is authentic evidence. The chief reason of his want of success was the extraordinary season, and the unusual rainfall; but there were several errors in his travelling system which experience would have corrected. Foremost among them was the choice of a season for travelling. If he had wintered in Hecla Cove, and started with light sledges and boats on runners early in February, he might have made good progress each day if the southerly drift of the ice had not commenced marching due north at a regular daily rate until his provisions were half consumed. Another mistake was involved in the daily allowance of food, which was too small, as experience soon proved; and the weight of 264 pounds per man was too heavy. But these points could only be learnt by experience, and Sir Edward Parry has the credit of having been the pioneer of arctic travelling, and of pointing out the true way of exploring the unknown polar regions. His party still retains the glory of having reached the highest northern latitude that has yet been attained by civilised man.

CHAPTER VI.

THE SPITZBERGEN ROUTE.

SWEDISH AND GERMAN EXPEDITIONS—ENGLISH YACHTSMEN—NORWEGIANS—THE SWEDISH EXPEDITION OF 1872-73—LEIGH-SMITH.

SINCE the last voyage of Parry, much exploring work has been done in the seas round Spitzbergen, and at the edge of the Polar pack, by the Swedes, by English yatchsmen, by Germans, and Norwegians. Thus the western and northern coasts of Spitzbergen have been well known for nearly three centuries; and a brief allusion to the natural causes which have enabled thousands of vessels to visit them during the last 276 years, while the eastern coast and its offlying islands still await thorough exploration, is now necessary; for modern efforts have mainly been directed to extending our knowledge of the eastern and least known side of Spitzbergen.

The great Spitzbergen archipelago feels the effects of two ocean currents flowing from opposite directions. The Polar stream flows from east to west along the coast of Siberia, receiving great harvests of drift-wood from the Asiatic rivers. It then sweeps round the north end of Novaya Zemlya, and drifts the Polar ice and the Siberian trees upon the north-eastern and eastern shores of Spitzbergen and its out-lying islands. Hence the eastern side is blocked up with ice during most seasons, and its beaches are covered with drift-wood. The Polar current also carries the ice down between Spitzbergen and Greenland, and along the east coast of Greenland to Cape Farewell, at the maximum rate, according to Scoresby, of from eight to twelve miles a day. The warm current, from the Atlantic, forks off the south end of Spitzbergen. One portion flows on to the Novaya Zemlya coast, where it eventually mingles its water with the Polar current. The other branch flows up the west coast of Spitzbergen, and keeps it comparatively free from ice, although the ice streaming out of the Spitzbergen fiords edges it off to some distance from the land. Meeting the Polar current, its greater specific gravity, caused by its containing more salt than the Polar water, makes it plunge into the depths, and for a time become a submarine current, flowing in a direction contrary to that of the Polar current. Salt water weighs 28 per cent. more than distilled water, and the Gulf Stream contains thirty-five thousandths of salt to thirty-three thousandths in the Polar current. Moreover, bodies of water in rapid motion do not readily interchange their temperatures, so that a warm stream might flow beneath a cold stratum for a considerable distance without mixing. When Mr. Leigh Smith obtained some sea temperatures at various depths, off the north-west point of Spitzbergen, while the water on the surface was only a degree or two above freezing, he found the temperature at 500 fathoms to be 52°, and once even 64° Fahrenheit. Scoresby also suggests that the warm stratum is an extension of the Gulf Stream which, on meeting with water near the ice lighter than itself, sinks below the surface and becomes for a time a counter under-current. The branch of the Gulf Stream, which thus becomes a submarine current, slowly and gradually mixes its waters with the Polar streams, as it loses its velocity owing to the tendency of the warmer water to rise; and eventually becomes a part of it. Thus, Forchhammer has ascertained that the cold current flowing down the east coast of Greenland from the north contains Atlantic water. These oceanic movements account for the ease with which western and northern Spitzbergen have been explored, while the eastern side still retains many of its secrets, and invites the explorer.

The Swedish investigations in Spitzbergen have been continued under Professor Nordenskiöld, in five consecutive expeditions during 1858, 1861, 1864, 1868, and 1872. The expeditions have been sent with a view to making zoological, botanical, and geological collections, and to instituting a preliminary survey for measuring an arc of the meridian from the most northerly islands to the extreme south point. The expedition of 1864, conducted by M. Nordenskiöld and M. Duner, made astronomical observations at eighty different places on shore; and fixed the height of numerous mountains, the loftiest being Horn's Sound Peak, which was found to be 4,560 feet above the sea. The Swedes pressed farther east, on the north coast, than either Phipps or Parry, and rounded Cape Platen, to the east of the Seven Islands. They also, in 1864 and 1868, went down Hinlopen Strait nearly to its south-eastern entrance, and sighted land to the eastward, which has been called 'Swedish Foreland,' but which they at first believed to be the Gilies Land of Van Keulen's chart. It was in reality Wiche Island. In 1868 the Swedes had an iron steamer, the 'Sophia,' in which they attained a latitude of 81° 42′ N. in the meridian of 18° E. during the month of September.

The observations of the Swedes on the subject of the possibility of sailing or steaming through the Polar pack, confirm those of all the explorers that have gone before them since the day of Barents and Hudson. M. Nordenskiöld says: 'The field of drift ice to the north of Spitzbergen consists of ice so closely packed together, that even a boat cannot force its way between the pieces, still less a vessel, though propelled by steam. In autumn the southern boundary of the ice moves, after long southerly winds, considerably to the north. Vessels can therefore sail at some period of almost every year along the north coast of Spitzbergen, in a tolerably clear sea; and in September and October it may happen that open water is to be found as far northwards as you can see from the vessel. The eastern coast is nearly always blocked up with ice. The idea that the Polar Basin is composed of an open sea, only here and there covered with drift ice, is in itself so contrary to all experience that it scarcely merits refutation. All experience seems to prove that the Polar Basin, when not covered with compact unbroken ice, is filled with closely-packed unnavigable drift ice, in which, during certain very favourable years, some large apertures may be formed, which apertures, however, do not extend very far to the north. It would be particularly unwise to choose the spring for an attempt to pass through the Polar pack and the passage of east Spitzbergen. At that time, and by that passage, it would be difficult, if not impossible, to reach even 78° of north latitude; whereas, on the west side, one can every year depend upon reaching the 80th degree of latitude; and in favourable years it might be possible, in September and October, to sail even a couple of degrees higher.'

Dr. Petermann incited his countrymen in Germany to join the noble band of Arctic explorers ; and at his own risk he fitted out a small vessel called the 'Germania,' which sailed from Bergen on May 24, 1868, under the command of Karl Koldewey, a native of Hoya, in Hanover. The whole crew only numbered eleven men. Unable to approach the east coast of Greenland, he made for the Spitzbergen seas, and attained a latitude of 81° 5′ N. Captain Koldewey then sailed down Hinlopen Strait in August, sighting Wiche Island, and returned to Bergen on September 30, 1868.

In 1870 the Baron von Heuglin and Count Zeil sailed for Spitzbergen in a vessel commanded by the Norwegian captain Nils Isaksen, and first explored Stor Fiord, between the main land of Spitzbergen and Edge and Barents Islands. Van Heuglin also examined the whole extent of Alderman Freeman's Strait (Walter Thymen's Strait of the Dutch), which divides Edge from Barents Island, and rounded the north-easternmost point of Edge Island, which has been named Cape Heuglin. On August 16, 1870, Von Heuglin ascended a hill near the Cape, about 1,200 feet high, called Mount Middendorf, and sighted extensive land on the eastern horizon, consisting of a range of peaks half covered with snow, with land behind them. He believed this to be a discovery, and to be part of a great continent, and Dr. Petermann named it King Karl Land. But, as has already been explained, it is undoubtedly the Wiche Island discovered by the English in 1617.[1] On the southern shores of Freeman's Strait Von Heuglin discovered a vast accumulation of drift-wood, consisting of large stems of larch and birch, with occasional fragments of wreck. This drift-wood is apparently deposited by the current, the set of which is from the east and north-east. According to Von Heuglin, the current thence turns southward, washing the eastern shores of Edge Island, and finally commingling with the northward branch of the Gulf Stream in about the latitude of Bear Island, occasioning the prevalence of storms and mist round that island.[2]

Among English yachtsmen, Mr. Lamont has been the earliest and most persistent navigator of the Spitzbergen seas.[3] In 1861 he was off the south coast of Edge Island, and among the thousand islands, extending as far as the Ryk Ys Islands of the Dutch, which Scoresby had supposed to be Wiche Island. Mr. Birkbeck also made a yacht voyage to Spitzbergen in 1864, accompanied by Professor Newton of Cambridge and Mr. Graham Manners Sutton; and he hired a Norwegian sloop to accompany him. The two vessels separated off Stor Fiord. Mr. Newton, in the yacht, tried in vain to sail up the Fiord; while the sloop held on the N.E. as far as the Ryk Ys Islands, and sighted distant land to the eastward, which must have been Wiche Island. The sloop was stopped by the ice, and had to return without doing as much as had been hoped.

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[1] See p. 40.

[2] 'Reisen nach dem Nordpolarmeer in den Jahren 1870–71, von M. Th. von Heuglin.' Erster Theil. (Braunschweig: G. Westermann. 8vo. 1872.)

[3] See 'Seasons with the Sea-horses; or, Sporting Adventures in the Northern Seas.' By James Lamont, F.G.S. (Hurst & Blackett, 1861.)

But the most interesting voyages of recent times are those which have been undertaken by Mr. Leigh Smith, with a view to attaining the highest possible latitude, and of exploring the unknown lands to the eastward of Spitzbergen. In the year 1871 he was accompanied by the Norwegian Captain Ulve, and he was fortunate in finding a very favourable season for his purpose. He sailed down Hinlopen Strait in August, and reached a position at its south-eastern outlet, where Koldewey had been in 1868. He discovered this position, formerly supposed to be a peninsula, to be an island, having walked round it while out shooting, at one spell of eighteen hours. It is marked on the map as Waygat or Wilhelm Island. From this point he could see the land on the opposite shore, stretching far away a little north of east, and the farthest point was named Cape Mohn. This discovery of Smith and Ulve gives a considerable prolongation to the southern shore of North-East Land. The eastern sea was blocked with ice as usual, so Mr. Smith returned to the north coast, and visited the Seven Islands in September. He then rounded Cape Platen, and sailed about forty miles to the eastward, where the coast of North-East Land was still trending towards the east. The farthest visible point has been named Cape Smith. His observations have considerably altered the shape and enlarged the area of North-East Land; both the southern and northern shores extending very much farther to the eastward than was previously supposed. He subsequently, on the meridian of 18° E., attained the latitude of 81° 24′ N., in September 1871. This was the highest that had then been reached in a ship, except by Scoresby in 1806 (81° 30′ N.), and by the Swedes in 1868 (81° 42′ N.). In 1872 Mr. Leigh Smith again sailed for Spitzbergen in his yacht the 'Samson,' but it was an unfavourable season. His vessel was considerably injured by the ice, and he was unable to get farther east on the northern-east coast than Weyde Bay. In 1873 he undertook a third voyage, which will be more fully referred to presently.

It is, however, to the hardy Norwegian sealing captains, and to Professor Mohn of Christiania, who has watched over and utilised their work, that nearly all our knowledge of the eastern side of Spitzbergen is due. The fishery has been carried on by Norwegians since about 1820; but for many years they kept to the western side, and only by degrees extended their operations along the northern coast. They called the passage between the Seven Islands and the north cape of North-East Land the 'Northern Gate,' and the south-eastern outlet of Hinlopen Strait the 'Southern Gate;' and both were usually blocked up with ice. Captain Carlsen was the first to venture through the 'Northern Gate' in 1863, and he completed the circumnavigation of Spitzbergen. His was the first vessel that ever sailed round that group of snow-clad mountainous islands. She was a brig called the 'Jan Mayen.' On August 2, 1863, Captain Carlsen passed the Seven Islands, and on the 14th he had rounded the extreme point of North-East Land, and was beating through the channel between the main land and the 'High Island' (Groot Hoog Eyl) of the Dutch chart. On the 16th he sighted (Gilie's) Land; and on the 18th the 'Jan Mayen' sailed along the coast of Barents and Edge Islands, and past the entrance of Alderman Freeman's Strait. On the 21st she sailed round Hope Island, thus completing the circumnavigation; a feat which has never been performed before or since. Captain Carlsen has thus circumnavigated both Spitzbergen and Novaya Zemlya, and for this great nautical feat he has received a gold watch, as a recognition of his brilliant achievements, from the Royal Geographical Society.

In 1864 the Norwegians made another most important voyage, passing through the 'Northern Gate,' and returning in boats by the 'Southern Gate,' thus completing the circumnavigation of North-East Land, but they left their vessels behind. Early in August 1864 Captain Tobiesen, in command of the schooner 'Æolus,' fell in with Capts. Aarström and Mathilas off the Seven Islands, and they determined to pass the 'Northern Gate' and round the eastern point of North-East Land in company. On the 7th, when about twelve miles N. by W. of that point, they sighted Gilies Land, bearing S.E. by S. That unvisited isle, never seen except by Carlsen in the previous year since the stout Dutch skipper discovered it in 1707, remained in sight during the 7th and the whole of the 8th of August; and in the following days a great number of seals and walruses were secured on High Island, the Groot Hoog Eyl of the Dutch. But when they tried to return by the way they came, the Norwegians found so much drift-ice coming from the north, and blocking up the passage at Walrus Islands, that escape in that direction was impossible. The three vessels then tried to make their way to the southward, along the east coast of North-East Land, which, as the Dutch described it, is bordered by a continuous ice-field. They could not reach the 'Southern Gate' in their vessels, so they were obliged to take to their boats, and abandon their valuable property, including seals and walruses worth 1,100*l.* The boats went up Hinlopen Strait, and all along the northern and western sides of Spitzbergen, to Ice Fiord, a distance of 700 miles, before they were picked up—Tobiesen by a sealing vessel; Aarström and Mathilas by the 'Axel Thoresen,' of the Swedish Expedition. This remarkable adventure turned the attention of the Norwegians to Eastern Spitzbergen, as a new country abounding in seals and walruses; and it was suggested that it would be easier to reach it by sailing directly east from Bear Island, instead of going round Spitzbergen to the 'Northern Gate.' In fact, it was said that such a voyage was made by a Hammerfest captain in 1854, who actually landed either on Gilies or Wiche Island.

In July 1872 Captain Altmann found the eastern side of Spitzbergen freer from ice than he had known it for twenty years. He sailed from Ryk Ys Islands on the 26th, and on the 28th he sighted what he supposed to be Gilies Land, but which was really Wiche Island, discovered by the English in 1617.[1] The ice was packed close in shore, but Altmann sailed along the land, which appeared to be composed of three large and several small islands. On his map the three islands are named Bear, Gilies, and Fast-ice Islands, the southernmost point of the latter being in 78° 43′ N.

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[1] See p. 50.

Captain Nils Johnsen, in the schooner 'Lydiana,' sighted the same land, in latitude 78° 10′ N., on August 16, and anchored close to it on the following morning. He landed, with some of his men, to collect drift-wood for fuel, which was plentiful. The coast trended on from N.E. to S.W., and terminated in a lofty hill, which rose sheer out of the sea like an upright wedge. It was named Cape Tordenskiold. Beyond this promontory the land takes a westerly direction, and appeared to curve into a deep bay, but there was a thick fog at the time. At some distance from the land three prominent hills looked like three separate islands, but, on a closer approach, low land could be seen to connect them. One of these mountains, crowning the north-east point, was named after Captain Johnsen. He climbed to the top of it, and saw the two other conspicuous hills, one to the south west, and the highest to the west. The southern and eastern shores were free from ice, but the edge of the pack was close in shore to the north. There was a vast mass of drift-wood on the beach, and some fragments of wreck, which had accumulated to a height of 20 feet above high-water mark.

Although decayed with age, some of it answered capitally as fuel. The greater portion consisted of the trunks of fir trees; and their position favoured the conclusion that the land must have been upheaved to the height of 20 feet at some comparatively recent period. Among other animals a fine reindeer was shot, in such good condition that there must be good store of pasturage somewhere on the island.

Captain Nilsen, in the schooner 'Freia,' sighted the same land on July 27, and noticed its steep cliffs, rising to a height of 1,000 to 1,200 feet. On the 31st the 'Freia' was off a small island at the extreme eastern point of the group, named Abel Island on the chart. To the east and north the sea was free from ice, except that a chain of bergs was drifting south. Sailing along the northern coast of the island, Nilsen saw that the Bear and Gilies Islands of Altmann were continuous. On this westward voyage great masses of ice were seen to the north, some of them 200 feet high and half a mile long. He sailed westward until he sighted Cape Torell, and then retraced his steps. On August 8 he sighted a high mountain on the re-discovered land, and thence followed the coast-line to the south-west. He must thus have circumnavigated the new land, but on the chart his track is shown as returning round the eastern point.

The high mountain seen by Nilsen was named Haarfagrehangen after Harold Haafagre; for in the year 1872 the Norwegians celebrated the 1000th anniversary of their union into one kingdom under that king. This large island, as has already been shown, was discovered, and named Wiche's Land by the English, in 1617.

In 1871 there were thirty-three sailing vessels from Tromsö, twenty-four from Hammerfest, and one from Vardö, engaged in the Arctic sealing trade. They average from thirty-five to forty tons apiece, and carry crews of ten or twelve men. In the same year five ships, including two steamers from southern towns, sailed from Tromsö to catch white whales in the Spitzbergen seas, besides one or two sailing yachts from Christiania; and the 'haakjewing' (shark) trade was represented by eight ships of Tromsö, fishing on the Spitzbergen bank. This same fishery for sharks, which yields cod-liver oil, employed fifty vessels from Hammerfest and Vardö, with an aggregate of 1,070 tons and 277 men.

Since the temporary abandonment of Arctic enterprise by Great Britain, Sweden and Norway have, with a skill and a resolution which do the highest honour to the gallant Scandinavian nation, perseveringly continued, year after year, to prosecute scientific investigations within the Arctic circle. Year by year, too, the Swedes and Norwegians have acquired experience in ice navigation; and their steady determination to achieve success is a sure sign that they will eventually attain their end.

The Swedish expedition of 1872–73 was mainly equipped with the aid of funds subscribed in Göttenburg, under the superintendence of Professor Nordenskiöld, and it sailed from Tromsö on July 21, 1872. It was composed of the steamer 'Polhem,' the brig 'Gladan,' and the steamer 'Onkel Adam.' The 'Polhem' is a Government steamer, hitherto employed, during the winter, on postal service between the island of Gothland and the mainland of Sweden, and she is specially adapted for forcing her way through the ice. She was built in 1858, is 108 feet long by 20 feet extreme beam, draws 8 feet of water, and is propelled by a high-pressure engine of 60 horse-power, consuming, at full speed of 9 knots, 15 cubic feet of coal. She carries 1,960 cubic feet of coal, sufficient for from 131 to 164 hours' consumption. The 'Polhem' was commanded by Lieutenant Palander, of the Swedish Royal Navy, and was manned by officers and men of the same service. She was to remain out during the winter. She was accompanied by the Government transport brig 'Gladan,' and the steamer 'Onkel Adam,' freighted at Göttenburg; which vessels took out a dwelling-house, reindeer, supplies of moss and coal, and were to have returned to Sweden before the winter set in.

Commander Palander and his officers; Professor Nordenskiöld, Dr. Envall, Professor Wykander, Lieutenant Parent, an Italian officer; two engineers, nine Swedish seamen, and four Laplanders, were to have remained throughout the winter; but during the summer the expedition was also to be accompanied by Dr. Kjellman, a naturalist, the crews of the 'Gladan' and 'Onkel Adam,' and several supernumeraries.

Besides coal, the expedition was supplied with 1,500 pounds of photogene oil, for lighting and fuel during the sledge journeys. The dwelling-house, for winter quarters, consisisted of six rooms, including the kitchen, larder, bathing-room, and potato cellar. One of the rooms was fitted up with a carpenter's bench and turning lathe, and other appliances. There were also three large sheds attached to the house, adapted for observatories; the supply of provisions and clothing was abundant, the former being sufficient for two years, and the latter including Lapp costumes for the winter for the whole of the party. For the sledge travelling parties, 900 pounds of pemmican were provided, concentrated rum, and cooking apparatus, with photogene oil, warm sleeping bags, and sailcloth tents. Three light ice-boats, weighing respectively 150, 200, and 300 pounds, and two larger boats, built with double planking, for the boat equipment, and all were provided with ash-wood sledges. Fifty reindeer were shipped at Tromsö, most of them from Kola, in Lapland; the reindeer of that district being the most hardy, and the best for driving. But reindeer, though hardy, are very sensitive to change of climate. Experienced Laplanders, to drive and attend the reindeer, and four or five reindeer dogs to assist in watching them, accompanied the expedition, and 3,000 sacks of reindeer moss were taken for forage. Unluckily all the reindeer escaped soon after they were landed. Professor Nordenskiöld took out a complete set of magnetic instruments by Lonant of Munich; a magnetic variation instrument by Wrede; a transit instrument by Estel; a portable meridian compass by Repsold; a register apparatus connected by electric regulated clockwork; three chronometers in cases, and two pocket chronometers; pendulum apparatus; sextants; a theodolite for geodetic measurements; all requisite appliances for zoological, botanical, and mineralogical researches; and photographic apparatus.

The plan of the expedition was to pass the autumn on the eastern side of Spitzbergen, and to winter in Mussel Bay, or off Parry Island.

Unfortunately the two vessels attached to the expedition which were intended to return in the autumn of 1872, were detained by the ice, and were obliged to winter in Spitzbergen, with the 'Polhem.' The exploring vessel, by having to maintain other ice-bound craft through the winter, was thus crippled in her resources. Six fishing-vessels, with an aggregate of 58 men, were also frozen in, off Grey Point, on the northern coast, and eighteen of their men reached Ice Fiord by sailing along the coast in open boats. Two of the vessels escaped, with the remainder, in November. The Swedish expedition, consisting of three vessels, wintered in Mussel Bay, a small inlet on the east side of Wyde Bay, on the northern coast of Spitzbergen. Much sympathy was excited in Norway by the news of the fishermen wintering in Ice Fiord, and immediate but unavailing measures were adopted for their relief. In November 1872 the steamer 'Albert,' commanded by Captain Otto, sailed from Norway for Ice Fiord, but was obliged to return owing to bad weather and the intense cold. Captain Kjelsen, in the 'Isbiorn,' then made another gallant attempt to effect a rescue. He sailed from Tromsö on December 24, and the days sensibly shortened as he went northward. The cold soon rendered navigation very difficult; the sails were like boards, and the shrouds were covered with ice in thick masses. Still they stood gallantly on, and came in sight of Bear Island on January 8, seeing the ice light—the luminous appearance in the sky which is always seen over the ice—on the same day. The vessel was now one mass of ice, and the prospect of reaching Spitzbergen seemed very slight. The attempt was therefore very unwillingly relinquished, and on January 14, 1873, the 'Isbiorn' was safely anchored again off Tromsö. Nothing daunted, a third vessel sailed for the rescue in the end of the same month. This was the seal-hunter 'Groenland,' commanded by Captain Jacob Melsom. She arrived off Bel Sound, in Spitzbergen, on March 6, and the captain forced his vessel, under full steam, through the pack ice, up to the entrance of Ice Fiord, where she was stopped. It was impossible to approach the land, and the captain was obliged to give up his plan of sending a rescuing party over the ice, to the interior of the Fiord. The ice was a mixture of bay and old pack, covered with hummocks, and the vessel was ten miles from land. She ran the risk of being blown off while the sledge party was away. Captain Melsom died on April 27.

The 18 men who retreated to the house in Ice Fiord, found it well stocked with fresh and salt provisions, and provided with a good stove. Their fate was discovered last summer, by Captain Mack. They all died during the winter, and a diary which they had kept from October 7, 1872, to April 19, 1873, revealed the cause of the disaster. They had preferred salt to preserved meat, and had taken no regular exercise. Their death is a most striking proof of the necessity for discipline and proper authority, in Arctic expeditions; and, with the fate of these poor Norwegians before their eyes, added to the experience derived from the expeditions of M'Clintock, Ross, Kane, Hayes, and Hall, persons who advocate the despatch of private expeditions to winter in the ice incur a very serious responsibility.

The Swedish expedition, with the advantage of naval discipline, only lost two men during the winter, all the rest enjoying good health. They occupied themselves with severe bodily exercise, and a wholesome diet was enforced. The officers were engaged in scientific pursuits, and made very rich collections in botany, zoology and geology. In the end of April Captain Palander and Professor Nordenskiöld started on a sledge journey with 14 men. Skirting the north coast of North-East Land, they rounded Cape Platen, and then struck inland, marching across the snow-covered hills back to Mussel Bay. They returned, after an absence of 60 days, on June 29. In the summer they were visited by the 'Diana,' and Mr. Leigh Smith generously supplied them with fresh provisions; and on August 6, 1873, the 'Polhem' returned to Tromsö. For his services on this occasion, King Oscar II. conferred upon Mr. Leigh Smith the order of the Pole Star. The Swedish expedition thus failed in its main object of advancing to the Pole, over the ice.

Mr. Leigh Smith sailed from Dundee, on May 10, 1873, on his third voyage of discovery in the

Spitzbergen seas. The 'Samson,' his own yacht, in which he made the voyage of 1872, sailed from Hull on May 1, under the command of Captain W. Walker (who formerly had the whaling steamer 'Polynia'), laden with stores. She was to be stationed in Cobbe's Bay, near the north-west point of Spitzbergen, and if any accident happened to Mr. Leigh Smith's vessel, his party would thus have had a second ship to fall back upon. Mr. Leigh Smith's steamer for the exploring work was the 'Diana,' belonging to Mr. Lamont. She is well strengthened for ice navigation with an iron stem-piece and iron pieces on the bows, for several feet above and below the water-line; but she is scarcely large and heavy enough for boring and charging the floes. Her tonnage is 103, and she has an engine of 50 horse-power. She had twenty hands on board, all told. Captain Fairweather, the sailing master of the 'Diana,' is an experienced and intelligent young seaman, who was first mate of the 'Victor' in 1872, in Baffin's Bay. He now commands the whaler 'Active.' Mr. Leigh Smith was also accompanied by the Rev. Mr. Eaton as naturalist, by Lieutenant Chermside, R.E., and by Mr. Richard Potter. The 'Diana' first proceeded to Jan Mayen Island, and thence worked northwards along the edge of the ice. After relieving the Swedish expedition, Mr. Leigh Smith made several attempts to push to the north and east, but without success. The season was very unfavourable, and the ice was pressed upon the northern shores of Spitzbergen. He, however, reached and partly surveyed the Seven Islands, again explored Hinlopen Strait and the south shore of North-East Land, and took several interesting deep sea soundings. Lieutenant Chermside also made some excellent photographs of Artic scenery. Finally, they made an unsuccessful attempt to reach Wiche Island, by rounding the southern extremity of Spitzbergen, and the 'Diana' returned to Dundee in September 1873.

In the summer of 1874 Mr. Rickaby, a young sportsman, who had previously been for a cruise in Baffin's Bay, went out in the 'Samson' to Spitzbergen, but the ice was closely packed upon the northern shore; and he returned without any geographical result.

The experiences of the Swedish expedition, and of this third voyage of Mr. Leigh Smith, furnish additional proofs that but very little progress can be made in exploring the unknown North Polar area by the Spitzbergen route.

This route for North Polar discovery has usually been advocated by those who believe in a vast navigable ocean, free of ice, round the Pole; and it may be as well, in this place, to glance at their stock arguments.

I believe no one really thinks that the Gulf

Stream, after passing under many hundreds of miles of a cold super-stratum of water, emerges from the depths and reaches the surface at so warm a temperature near the North Pole as to melt the ice far and wide. The Gulf Stream slowly mingles with the Polar current, and eventually its waters go south again along the east coast of Greenland, on the surface.

But there are two other arguments which deserve passing notice.

One is, that the sun, with greater power than it has at the Equator, pours its rays on the North Pole without intermission for six months. Scoresby answered this argument fifty years ago. He pointed out that in Northern Spitzbergen the sun also has greater power than at the Equator, and shines for four months without intermission. Yet, in that region, the average annual temperature is 17° Fahrenheit, and ice forms on the sea during ten months out of twelve. The difference that the other two months would make is inappreciable, seeing that the four months of sun make so little. Speculators on this question have left many points out of consideration. The dryness of the Polar atmosphere is equally the cause of the great heating power of the sun's rays, and, by reason of the more rapid terrestrial radiation, of the excessive cold.

The other argument is much more generally adopted, and appears at first sight more plausible. It is that the enormous fields and floes of ice which drift away to the south during the summer, leave a wide space of open sea round the North Pole. By way of proof, it is urged that in the Antarctic regions Sir James Ross pushed through 800 miles of pack ice, and reached an open sea to the south of it; being the space whence it had drifted. But the analogy is false, as Admiral Collinson well pointed out at a meeting of the Royal Geographical Society in 1865. The Antarctic pack was drifting away from a solid line of immovable grounded ice cliffs, and of course left open water in its rear, because there was no moving ice further south to take its place. Unless there is a continent or a similar immovable line of ice cliff at the North Pole, the North Polar pack does nothing of the kind. The exact analogy to the voyage of Sir James Ross is that of Scoresby. The Antarctic pack, in latitude 75° S., is analogous to the ice met by whalers in the early spring in 75° to 76° N., through which they can usually pass. The open water north of Spitzbergen is analogous to the open sea found by Ross in the south; and the Polar pack which Scoresby found bounding that open water to the north, from whence the ice he had passed through had drifted, is analogous to Ross's line of impenetrable ice barrier.

If no open Polar basin exists, the reason is, that there is no extent of land or grounded ice barrier on the Spitzbergen meridians, to the north of that group, from whence the ice could drift and leave an open sea. This may be assumed for two reasons. One is that the masses of Siberian drift-wood on the Spitzbergen Islands and elsewhere would be intercepted if there was an extensive continent in their way; the other is that, as Parry advanced to his extreme point in 82° 45′ N., he found the water north of Spitzbergen rapidly becoming of very great depth. The North Polar land, if it exists, will probably be found in islands stretching north of the extreme north point on the west side of Kennedy Channel; and this is one reason why the route by Smith Sound should be selected for a Government Arctic Expedition.

The North Polar pack, drifting south, according to Scoresby, between Spitzbergen and Greenland, at the maximum rate of eight or ten miles a day, if there is no extensive land to the north, of course extends to far beyond the North Pole, as far as ice is formed on the other side, in 75° or 74°, a width of some 1,000 miles. The open sea left by its drift would not be at the North Pole, but on the coasts of Wrangell Land and Siberia, where the drift commences. No doubt, in the summer thaws, there is a great expansion of the ice, which causes open lanes and pools, at times of considerable extent; and other open seas would be caused by winds and currents throughout the year; but the above considerations lead to the conclusion, that a great permanent open sea round the North Pole is chimerical.

Nevertheless, there is much that is interesting in the examination of the deep sea to the north and east of Spitzbergen. With a good screw steamer, ably commanded by an experienced ice navigator, taking advantage of every opening, and knowing when to charge the ice and when to forbear, a very much higher latitude might be reached in a favourable season than has hitherto been achieved. Most valuable observations might then be made with regard to currents and sea temperatures; and future explorers may yet do good work in this direction to a limited extent.

CHAPTER VII.

THE EAST COAST OF GREENLAND.

For ages it was supposed that one of the Norman colonies of Greenland had been established on the eastern side of that continent, and had been isolated for centuries by the pack ice. The voyages sent out for the purpose of re-discovering this lost colony went to the threshold of the unknown region; for it is formed, in one part, by the eastern coast of Greenland. But, in his recent exhaustive demonstration of the authenticity of the voyages of the Venetian brothers Zeno, Mr. Major has fully established the fact, that the 'East Bygd' of the Normans was on the west, and not on the east coast of Greenland.[1]

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[1] Mr. Major's investigations have appeared in his introduction to the voyage of the Zeni issued by the Hakluyt Society in 1873. 'The Voyage of the Venetian brothers Nicolò and Antonio Zeno to the Northern Seas in the 14th Century, comprising the latest known accounts of the lost Colony of Greenland; and of the Northmen in America before Columbus. Translated and edited, with Notes and an Introduction by R. H. Major, F.S.A., &c.' (Hakluyt Society, 1873).

Mr. Major's discoveries are so interesting that a review of our knowledge of the threshold of the unknown region would be very incomplete without a notice of them. At the close of the fourteenth century, a member of one of the most ancient and noble families in Venice, Nicolò Zeno, at his own expense, went on a voyage, rather of curiosity than discovery, into the Northern Seas. For two centuries before his time the Flanders voyage from Venice had been a matter of annual occurrence, but chance gave to this voyage a very peculiar interest. Nicolò Zeno was wrecked on the Faroe Islands, but fortunately fell in with Henry Sinclair, Earl of Orkney and Caithness, who was bent on increasing his possessions by naval conquests, and who took Zeno into his service as pilot of his fleet. After a year or two, Nicolò Zeno sent a letter to his brother Antonio, inviting him to join him, which he did; and it is from that letter of Nicolò's, and subsequent letters from Antonio to a third brother, Carlo (a very distinguished man in Venetian history), that the narrative of the movements of the two brothers is derived.

The whole story had been written out by Antonio Zeno; but a descendant of his, named Nicolò Zeno, born in 1515, when a boy, not knowing the value of these papers, tore them up, but some of the letters surviving, he was able from them subsequently to compile the narrative as we now have it, and which was printed in Venice in 1558. There was found also in the palace an old map, rotten with age, illustrative of the voyages. Of this he made a copy, unluckily supplying from his own reading of the narrative what he thought was requisite for its illustration. By doing this in a blundering way, unaided by the geographical knowledge which enables us to see where he goes astray, he threw the whole of the geography which he derived from the narrative into the most lamentable confusion, while those parts of the map which are not thus sophisticated, and which are consequently original, present an accuracy far in advance by many generations of the geography even of Nicolò Zeno junior's time, and confirm in a notable manner the site of the old Greenland colony. In these facts we have not only the solution of all the discussions which have arisen on the subject, but the most indisputable proof of the authenticity of the narrative; for it is clear that Nicolò Zeno junior could not himself have been the ingenious concocter of a story the straightforward truth of which he could thus ignorantly distort upon the face of the map.

The story, as we have it, comprises, in the first instance, some insignificant expeditions in the Faroe and Shetland groups, but fortunately treats at greater length of a much more important subject, viz., a visit by Nicolò Zeno to Greenland, disclosing some interesting facts which, brought into harmony with recent observations, present a contemporaneous proof of the whereabouts of the lost colony of the Ostrebygd, about which there has been so much dispute, and to verify which the King of Denmark sent out Captain Graah on his famous voyage of 1828–30. In illustration of this portion of the subject, Mr. Major has adduced a highly important geographical discovery of his own, the ignorance of which led Captain Graah into great mistakes, and caused him to miss the value of a most precious early document which otherwise would have answered the question which he went out to Greenland for the purpose of solving. This was nothing less than a chorography of the old Greenland colony, and sailing directions for reaching it from Iceland, written by Ivar Bardsen, the steward of the bishop of the colony. In this route he speaks of some large rocks midway between Iceland and Greenland, called Gunnbjorns Skerries, which had formed a nucleus for the ice coming down from the north, and on reaching which a south-west course was to be taken. Captain Graah denied the existence of these rocks as thus described, and so forfeited the guidance of these valuable sailing directions. Mr. Major has discovered, by a legend in the 1507 edition of Ptolemy, that the island, of which these rocks form the summit, was blown up by a volcanic eruption in 1456; and in a map by Van Keulen, of about the date 1700, the reef, 60 miles in length, formed thereby, is laid down by the name of Gombar Scheer, with soundings at the north and south ends of 25 fathoms, whereas the nearest soundings northward range from 70 to 100 fathoms. Mr. Major further shows that Ivar Bardsen's chorography had only to be read with common attention to indicate the site of the old colony beyond all dispute.

The most prominent and interesting item in the story relating to Greenland, is the description of a monastery dedicated to St. Thomas, the cells of which were heated from a natural spring of hot water, which was used also by the monks for dressing their meat and baking their bread. The monks had likewise gardens covered over in the winter time and warmed by the same means, so that they were able to produce flowers and fruits and herbs, the same as if they lived in a temperate climate. Many other advantages are described as accruing to the monks from their judicious employment of this warm water supplied by nature. In corroboration of this fact, and its valuable bearing on that much-vexed question the site of the lost Scandinavian colony in Greenland, the testimony of Ivar Bardsen becomes most valuable, for after mentioning a monastery dedicated to St. Olaus and St. Augustine, he says that in a bay of neighbouring fiord, called Rafnfiord, are some small islands abounding in hot water. These are no doubt the hot springs of Ounartok, near which some remains of the buildings of the old colonists have been found, and Mr. Major has ascertained from Dr. Rink, the late Inspector of South Greenland, that there are no other hot springs to his knowledge in the district of Julianashaab, which is now definitely proved to be the site of the ancient colony. The position of Ounartok coincides admirably with the site of the monastery in Ivar Bardsen's chorography, and this point being established, may serve as a basis for tracing the topography of the entire colony.

The difference between the names of St. Olaus and St. Thomas, given by the two authors to the same monastery, is easily explainable, for the strange northern name of St. Olaus would sound to the southern ear of the Venetian like nothing so much as St. Thomas.

Antonio Zeno remained in the service of Earl Sinclair ten years after the death of his brother Nicolò, and the most interesting fact which survives to us, as coming from him, is the report of fishermen who had discovered some populous countries in the west, which are, beyond all question, North America. They found Latin books in the possession of one of the chiefs, but these were no longer understood. The people made beer—which was a 'kind of drink that North people take as we do wine.' Their foreign intercourse was with Greenland, whence they imported furs, brimstone, and pitch.

All this is in harmony with what we know of the Scandinavian settlements in North America, in Pre-Columbian times, and the fishermen's report is a *résumé* of the knowledge acquired by the Northmen in their expedition to the west and south-west. It was in the year 1001 that North America was discovered by Lief, son of Eric the Red. The tracts of country then discovered were called Helluland, *i.e.*, State Land, supposed to be Newfoundland; Markland, *i.e.* Woodland, supposed to be Nova Scotia; and Vinland or Vineland. There is much uncertainty about the two former, but the site of Vinland is less problematical, for, as we learn from one of the old writers, that the length of the day was nine hours, it gives us the latitude of 41°, and whereas the name was given by the old discoverers from finding the vine growing wild there; the more recent English discoverers, for the reason, but quite independently, gave the name of Martha's Vineyard to the large island close off the coast, in latitude 41° 23′.

There is one locality on the Zeno map which has given rise to the greatest perplexity. It is a large island called Icaria, lying where certainly no island does lie—at an equal distance between Iceland, Frisland or Faroe Islands, and Estotiland, supposed to be Newfoundland. Many have imagined it to be some part of America, but Johann Reinhold Forster was the first to suggest that it meant Kerry, and Mr. Major has proved that he was right, although by reasonings that Forster had not adduced. An expedition was organised by Earl Sinclair for the verification of the fishermen's story, but after leaving the Faroe Islands for the west, and when well at sea, the fleet was driven they knew not whither by a storm which lasted eight days. After the storm abated they discovered what is described in the original Italian as 'da Ponente terra.' Now this expression is susceptible of two renderings, either that they came upon 'an island to the westward,' or 'upon an island on its western side'; but, as when repulsed by the natives, they sailed round about the island, and came into a harbour on its eastern side, it is manifest that the harbour which they first entered was on the west, and in a position corresponding exactly with Kerry in Ireland. This peculiar point of arrival, and the name Icaria, which, at that place, they were told was the name of the country; the conduct of the natives, who would not allow them to land, and who, as the fleet made its way northwards along the east coast of the island, pursued it along the hill tops and howled the strangers off the shore, all go to show that Kerry and Icaria are identical. After leaving the north point of the island, the fleet sailed six days to the westward without seeing land, a fact which accords with the situation of Ireland, but not with any part of America, or any other country otherwise answering the conditions.

The anomalous position of the island on the map, whether due to Antonio Zeno or to the handiwork of his descendant Nicolò Zeno in his touching up of the map, is easily explained by the entire ignorance of the former as to where the fleet was after being beaten about for eight days by the storm. With this episode and the return of the remnant of the fleet to Frisland the Zeno narrative virtually concludes. The many riddles which it embodies, it must be acknowledged, have at length met with a complete solution at the hands of Mr. Major. If the realities which Mr. Major has detected had been made clear to people's minds, as they easily might have been, three hundred years ago, Martin Frobisher would have avoided the blunder of taking Greenland for Zeno's Frisland, which really meant the Faroe Islands; a host of learned commentators during that period would have been saved from confusing themselves and others by wild speculations; the site of the lost Greenland colony would have been established long ago on the highest possible authority; and the kings of Denmark, from Frederic II. downwards, would have been spared the necessity of sending out a great number of unsuccessful expeditions; many an elaborate work from the pens of some of the most illustrious *literati* in Europe, would have been rendered superfluous; and the name of a noble gentleman, occupying the exalted position of one of the Council of Ten in the Republic of Venice, would have been protected from the unwarrantable and infamous charge of being guilty of falsehood and forgery.

Yet there was some good in all this blundering, for the erroneous belief in a lost colony on the east side of Greenland led to the despatch of several Arctic expeditions. No less than eight were sent out by successive kings of Denmark, but none of them were able to reach the coast along the southern part of the eastern side of Greenland; though some islands were discovered by Captain Donnell. Hudson, as we have seen,[1] sighted the land which he called 'Hold with Hope,' but much farther to the northward; and in 1654, a Dutch skipper named Gale Hamke, had also been in sight of land. A bay was marked with his name on the old Dutch charts.

The valuable chart by Van Keulen, in the State Archives of the Hague, shows land forming part of the east coast of Greenland, in latitude 77° 10′ N., called 'Land van Edam,' discovered in 1655. Still farther north, in 78° 20′ N., another part of the coast was sighted in 1670, and marked on the chart as 'Land van Lambert.' Scoresby has the great merit of having forced his way through the ice floes which encumber the approach to land, in June 1822, and of having surveyed a line of coast from Gale Hamke's bay in 75° down to latitude 69°. He found a line of bold mountains, averaging a height of 3,000 feet, with precipitous cliffs rising from the beach, and rugged sharp rocks and peaks forming their outline against the sky. There were many openings or sounds, and he supposed that the coast, which he examined for a distance of 400 miles, consisted of an assemblage of islands. The body of ice off shore was a hundred miles wide, and there were chains of immense bergs, the produce of the stupendous glaciers of the interior; still there was little difficulty in sailing along the channel close in shore.

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[1] See p. 29.

From Scoresby's southern point in 69° N., there is a long stretch of coast-line still undiscovered; but the southern end of the east coast of Greenland was explored by Captain Graah of the Danish Navy, who left Copenhagen on this duty in 1828. He organised his expedition, consisting of two woman's canoes and two kayaks, at Nenortalik, the Greenland settlement nearest to Cape Farewell, and started on March 20, 1829, with four Europeans and twelve Esquimaux. On reaching the eastern coast, they found masses of ice piled upon the beach in such a way as to render their progress very slow; and Captain Graah sent back all the party except six Esquimaux, two men and four women, with one frail boat. This separation took place on June 23, in 61° 46′ 40″ N., and, with his small party, he had advanced as far north as 65° 18′ by July 28. He was at last stopped by an insurmountable barrier of ice, and was obliged to retreat towards the end of August. Captain Graah passed the winter at a place called Nugarlik in 63° 22′ N.; and returned to the settlements on the west side of Greenland in the summer of 1830. Between 60° and 65°, on the east coast, from 500 to 600 inhabitants were found: and they reported that there were more further north. But from Graah's furthest north to 69° the most southern point reached by Scoresby, the coast of east Greenland is still unknown.[1]

I have already mentioned that the 'Griper,' with Captains Clavering and Sabine on board,[2] after completing the pendulum observations at Spitzbergen, sailed for the east coast of Greenland in the end of July 1823. On the 28th an attempt was made to press through the ice, which isolates this eastern coast, in latitude 77° 30′ N., but the vessel was stopped by an unbroken field of ice 60 miles long. On August 2 the 'Griper' again entered the ice, in latitude 75° 30′ N., and passed through sailing ice, along the margin of the solid fields, to the south-west, thus at last succeeding in reaching the Greenland coast. While passing through the ice barrier, no indication whatever was observed of a southerly current. The mainland, consisting of lofty, bold, and precipitous mountains cut by bays and deep fiords, was laid down between the parallels of 76° and 72°, the most northerly land bearing N. 20° W. Captain Clavering also explored the bay of Gale Hamke, in 74° N., which is correctly laid down, as regards latitude, on an old chart engraved by Pieter Goos in 1666, twelve years after the voyage. Here some Esquimaux were met with, a most important discovery, as there is reason to believe that they must have come from the unknown region to the north, and not from the south. Captain Clavering was careful to retain old names in the construction of his chart of the new coast line.[1]

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[1] The work of Captain Graah was translated and published by the Royal Geographical Society in 1837, with a map. 'Narrative of an Expedition to the east coast of Greenland, sent by order of the King of Denmark in search of the lost colonies, by W. A. Graah, translated from the Danish by G. Gordon Macdougall for the R. G. S. (Map. 8vo.) London, 1837.'

[2] See preceding page.

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[1] His own names are:

1. Shannon Island.
2. Cape Philip Broke.
3. Pendulum Islands.
4. Cape Dresbrowe.
5. Bass Rock.
6. The Haystack (rock).
7. Roseneath Inlet.
8. Ailsa.
9. Ardencaple Inlet.
10. Cape Borlase Warren.
11. Jordan Hill.
12. Loch Fine.
13. Forster Bay.

The old names are: Hudson's 'Hold with Hope,' Bay of Gale Hamke, Brontekoe Isle.

The last expedition to search for the lost colony on the east coast of Greenland was undertaken by Messrs. Antony Gibbs and Sons, the eminent London and South American merchants; at the suggestion of Mr. T. W. Tayler, a chemist and enthusiast, whose readings of Icelandic literature had led him to believe that the lost colony might be found, and that a flourishing trade might be re-established. The crown of Denmark granted a charter to Messrs. Gibbs, through the agency of Mr. Tayler, for the exclusive right of trading with the east coast of Greenland. On August 21, 1863, an expedition was despatched from Gravesend, consisting of two iron steamers entirely unfortified, called the ‘Baron Hambro’’ and ‘Caroline,’ under the leadership of Mr. Tayler, with a view of forming a settlement at Ekalumiut, in latitude 63° N. The reason for sailing at so advanced a period in the year was that, as the most southern ports on the west coast of Greenland are not open until the ice has been carried past them by the Arctic current, it was believed that the same operation must have cleared the east coast, or at least have rendered it accessible somewhat earlier. On September 5 land was sighted from the ‘Baron Hambro,’ in the vicinity of Ekalumiut, which was estimated to be at a distance of forty miles. But the ice was so closely packed that a course was shaped to the north, and in 63° 30′ an attempt was made to work into the pack, which, however, was found to be so close as to be impenetrable, and with great difficulty the vessel was extricated. On September 8, another fruitless attempt was made at the ice, in 62° 30′, and on the 10th yet another effort was made in 61°, with a like result. It had become painfully manifest that it was useless to attempt to find or force a passage through the pack which intervened between the ships and the land, and the only remaining hope was that a gale of wind might drive the ice from the land. On the 11th, a heavy S.W. gale set in and lasted for three days, during which the 'Baron Hamro' and 'Caroline' were obliged to run out to sea. When the wind moderated, they again stood in, and at about 120 miles from the land were stopped by an immense field of ice, along which the steamers coasted at full speed for some hours. At last they doubled the southern point of the ice, and got within twenty miles of the land, in latitude 60° N.; but here again they were stopped by an impenetrable barrier of ice, closely packed upon the shore. There was no lane of water between the land and the ice. The attempt was then abandoned, and the expedition returned to England.[1]

But the failure was attributed to the employment of vessels which had not been specially adapted for ice navigation, and Messrs. Gibbs resolved to make another attempt, by equipping an expedition on a more adequate scale. The year 1864 was devoted to building the 'Erik' at Dundee. She is a fine steamer, of 412 tons and 70 horse-power, thoroughly well strengthened for work in the ice, and with angle-irons round the bows for charging the floes. The 'Erik,' again under the leadership of Mr. Tayler, sailed from Rekjavik, where a depôt of coals had been formed, in May 1865, then proceeding to the pack edge. Although the 'Erik' succeeded in forcing her way through the ice farther than was done by the two smaller steamers in 1863, she could not reach the land. Two attempts were made, and then the enterprise was finally abandoned, the 'Erik' having since made annual whaling voyages to Baffin's Bay, under the able command of Captain Walker. This interesting attempt to reach the east coast of Greenland reflects honour upon the merchants who undertook it, and entitles the Messrs. Gibbs to take their places in the same rank with those immortal merchant adventurers of the 17th century, whose gallant ships explored the edge of the Polar pack, and first sailed on the north water of Baffin's Bay. It is to such men that England owes much of her commercial and maritime greatness, and they will ever hold an honoured place in the list of Arctic worthies.

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[1] I have been kindly furnished with these particulars by Mr. John Clark, who accompanied the expedition sent out by Messrs. Antony Gibbs & Sons.

After the return of the 'Germania' from Spitzbergen in 1868, another Arctic expedition was organised to explore the northern part of the coast of Greenland. The second expedition sailed from Bremen, on June 15, 1869. It consisted of a screw steamer of 140 tons, which cost 18,000 thalers, and was re-named the 'Germania. Its crew numbered seventeen, while, as consort and storeship, was despatched the brig 'Hansa,' with a crew of fourteen, under the command of Paul Friedrich Hegemann, a native of Hooksiel, in Oldenburg. The whole expedition was put under the command of Koldewey, who took as his flag-ship the 'Germania;' and, in addition, there were attached to both ships several eminent men of science, provided with every requisite necessary for the successful performance of their duties. Here Lieutenant Payer, the future discoverer of Franz Joseph Land, gained his experience; and Mr. Copeland was the Astronomer to the expedition. King William came down and bade them good-bye; a distinguished party gave them a farewell dinner, and out of the good harbour of Bremen they sailed *more Teutonico* to the strains of a brass band. The whole expedition was provisioned for two years. In latitude 70° 46′ N., longitude 10° 51′ W., the 'Hansa,' which had on board some of the supplies of fuel for herself and consort, got separated from the 'Germania,' and caught in the ice. On October 22 the ice-floes, pressing on every side, crushed her. Then, homeless in the midst of this dreary ice-field, with the winter coming on, the crew built on the floe, with the patent fuel, a house in which they took refuge. In this strangest of all abodes they passed Christmas—not uncheerfully on the whole, they tell us. In two months the current had carried them south 400 miles, and though they were only 30 miles from land, it was impossible to reach it. On November 27, their track-map shows that they were just about half-way between Greenland and Iceland. Shortly after their Christmas festivities, the floe split and ruined their house. For some time it would seem as if their lives hung on a thread. But they were destined for better things. The floe righted again, and they left their boats, to which they had been forced to flee, and again built their fuel house. On January 3, 1870, they were close to the Greenland coast, but could only survey it in sadness, as the broken ice precluded the possibility of ever reaching it. As spring advanced and the summer came, their situation was more cheering in one sense, but more depressing in another. Their ice island had now, by the lashing of the surge and the melting of the ice, got reduced until it was not more than a hundred yards in breadth. By May their sextants told them they had drifted 1,100 miles on their cheerless raft. Finally, on June 14, 1870, they arrived in safety in their three boats at the Greenland Moravian Mission station of Friedriksthal, in latitude 60° N., just on the other side of Cape Farewell. Here they met their countrymen of the Herrnhuttian *Unitas Fratrum*, and once more were safe, after perils, compared with which even Barents' wondrous boat voyage from Novaya Zemlya pales, and Kane's escape from Smith Sound sinks to the dimensions of a boating excursion. Notwithstanding all their hardships, none of the crew died, but one of the party got insane, though, we are glad to hear, only temporarily.

Fairer fortune attended the steam-aided 'Germania.' She succeeded in sailing up the East Greenland coast to as high as 75° 30′, but on August 13 was forced to turn again to the southward, and winter among the Pendulum Islands, in latitude 74° 30′. From this central point many excursions were made, and though at times the thermometer sank as low as 40° below zero (of Fahrenheit), yet musk oxen—strange enough—being abundant (though these animals are unknown on the West Coast, south of Wolstenholme Sound), they passed a not unpleasant winter—as winters in 74½° of N. go. Christmas was absolutely warm (*only* 25° below zero), and with open doors they danced and feasted as it had been their wont in festive, Christmas-loving Germany. In Koldewey's words—'By star-light we danced upon the ice; of the evergreen *Andromeda* (*Cassiope tetragona*) we made a Christmas tree; the cabin was decorated with flags, and the presents which loving hands had prepared were laid out upon the tables; every one received his share, and universal mirth prevailed.' After this holiday time, the explorers began to think of business. The sledge equipments were got ready, and after one false start, a party of seven set out on March 24, under the command of Captain Koldewey and Lieutenant Payer—one of the scientific corps of the expedition. Dragging the provision-laden sledge behind them, they set their faces to the north, and after reaching a distance of 150 miles from the ship (in latitude 77°), want of provisions compelled them to return. On April 27, laden with zoological, geological, and botanical collections, but decidedly sceptical regarding the 'open Polar sea,' they regained the deck of the 'Germania.' A grim cape—which has been appropriately named after Prince Bismarck—marks the northern limit of their discoveries. As soon as navigation was again opened they commenced their explorations, and were fortunate enough to discover (in about latitude 73° 15′ N.) a branching fjord, stretching for a long distance in the interior of Greenland. This they explored between longitude 22° and 28° W., without reaching its termination, the leaking boiler of the engine compelling them to return. It was named Franz Josef, in honour of Lieutenant Payer's Sovereign. Along its shores are peaks (Petermann's and Payer's), respectively 14,000 and 7,000 feet high. On September 11, 1870, they returned to Bremen.

A superb work, published both in German and English, gives the results of the second German Arctic expedition. The Pendulum Islands and adjacent coast of Greenland were the farthest point northward of the German, as it had been fifty years before of the English navigator Clavering. The views of Captain Koldewey, after acquiring Arctic experience while in command of two expeditions, were expressed by himself in May 1871, and are as follow:—

'One can hardly resist the conviction that the hope of attaining the North Pole by ship, or of finding an open sea around the Pole, are alike among the most improbable of things.

. . . . . .

'I confess that I myself was misled by representations in Dr. Petermann's "Geographische Mittheilungen," and held it to be at least possible, by following a line of coast, to penetrate by ship far into the central Arctic regions, and then certainly to make one's way to the Pole. A winter in East Greenland, the most careful observation of those mighty masses of ice, their movements and formation, and of the whole conditions of temperature, and finally the careful study of Arctic literature in its original form, and not by means of one-sided extracts, have radically cured me and all my companions of this idea . . .

'If its principal object is to be the nearest possible approach to the Pole, I am quite of Osborn's opinion, that the best way appears to be through Smith Sound.'

In quoting Captain Koldewey's opinion, Admiral Sherard Osborn makes the following remark:—

'Comment on this honest seaman's opinion is unnecessary, and no amount of specious reasoning, spread over any amount of pages, by any mere theorist, be he German or English, can undo the effect of evidence so strong and conclusive.'

The opinions of all English Arctic authorities in favour of the route for exploring the Unknown Region by way of Smith Sound, are thus strongly concurred in by the principal German authority.

Five whalers sailed in 1874 from Peterhead to fish in the Spitzbergen seas. They occasionally approach the coast of Greenland. All but one are steamers. Two, the 'Eclipse,' 295 tons, commanded by Captain David Gray, and the 'Hope,' 307 tons, Captain John Gray, are steamers built specially for the trade by Messrs. Hall of Aberdeen. Two are old sailing vessels converted into screw steamers, namely, the 'Jan Mayen,' commanded by Captain Salmon, 337 tons, and 'Windward,' Captain Sellar, 321 tons. The 'Pole Star' 215 tons, Captain M'Dougall, is a sailing vessel. In the summer of 1872 Captain David Gray reported having seen a wide extent of open water, with a water sky to the northward, near the east coast. In 1873 he returned in the end of June with a full ship. In 1874 he reported a great and unusual southerly drift of the ice in the Spitzbergen sea. In May, June, July, and August, its average drift was fully 14 miles a day. In March and April it must have been driving at double that rate. In August Captain Gray was in 79° 45′ N., and found the ice all broken up, whereas in 77° the floes were lying whole and unbroken, showing that the ice farther north must have been broken by a swell from the north. There was a dark water sky beyond the pack which stopped Captain Gray, in 79° 45′, and open water to the horizon. This year would, judging from these appearances, have been a good one for gaining a higher northern latitude than usual, very late in the season.

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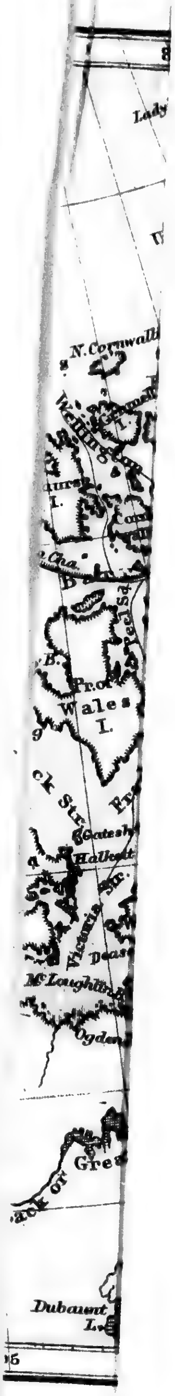
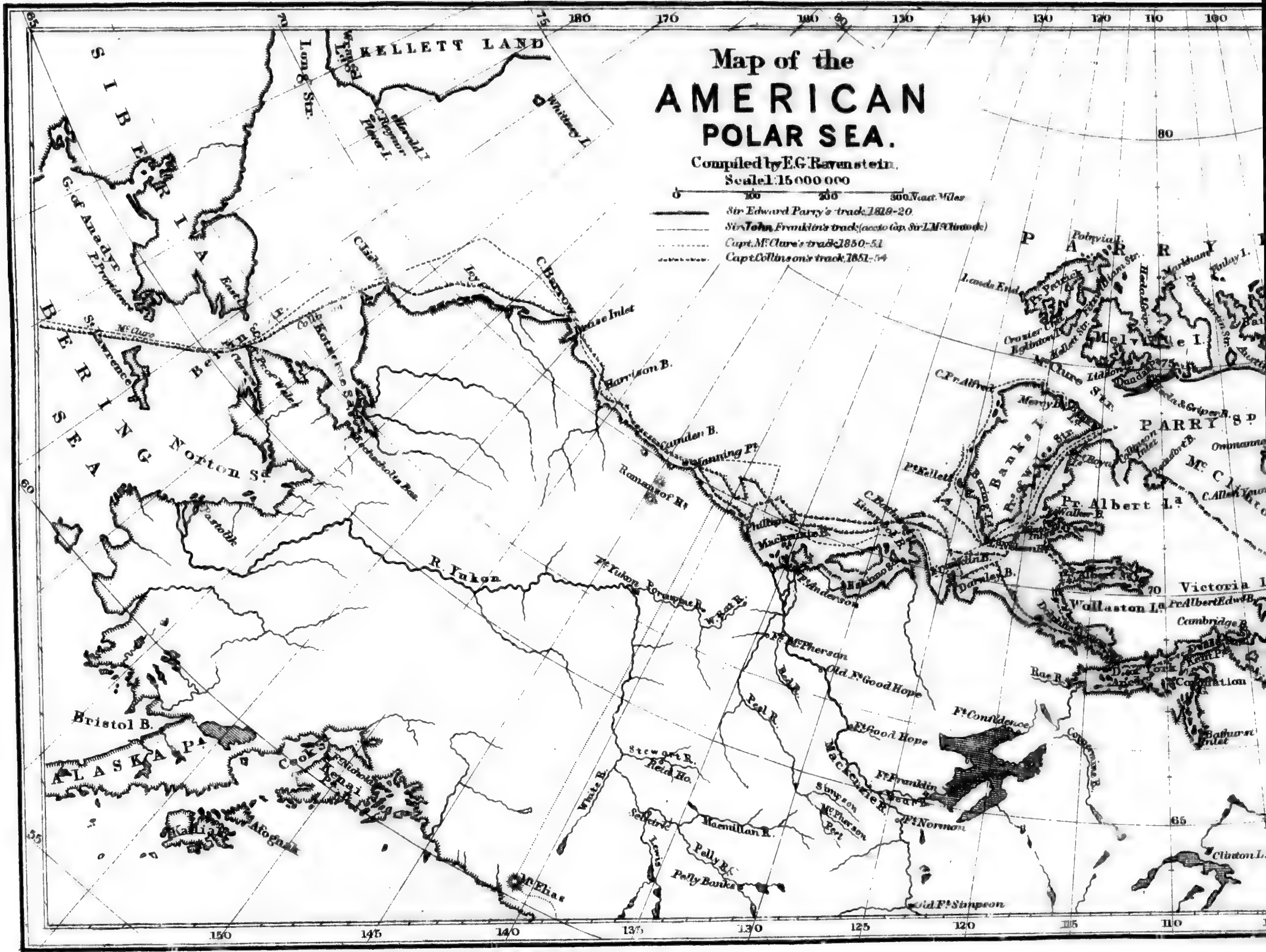
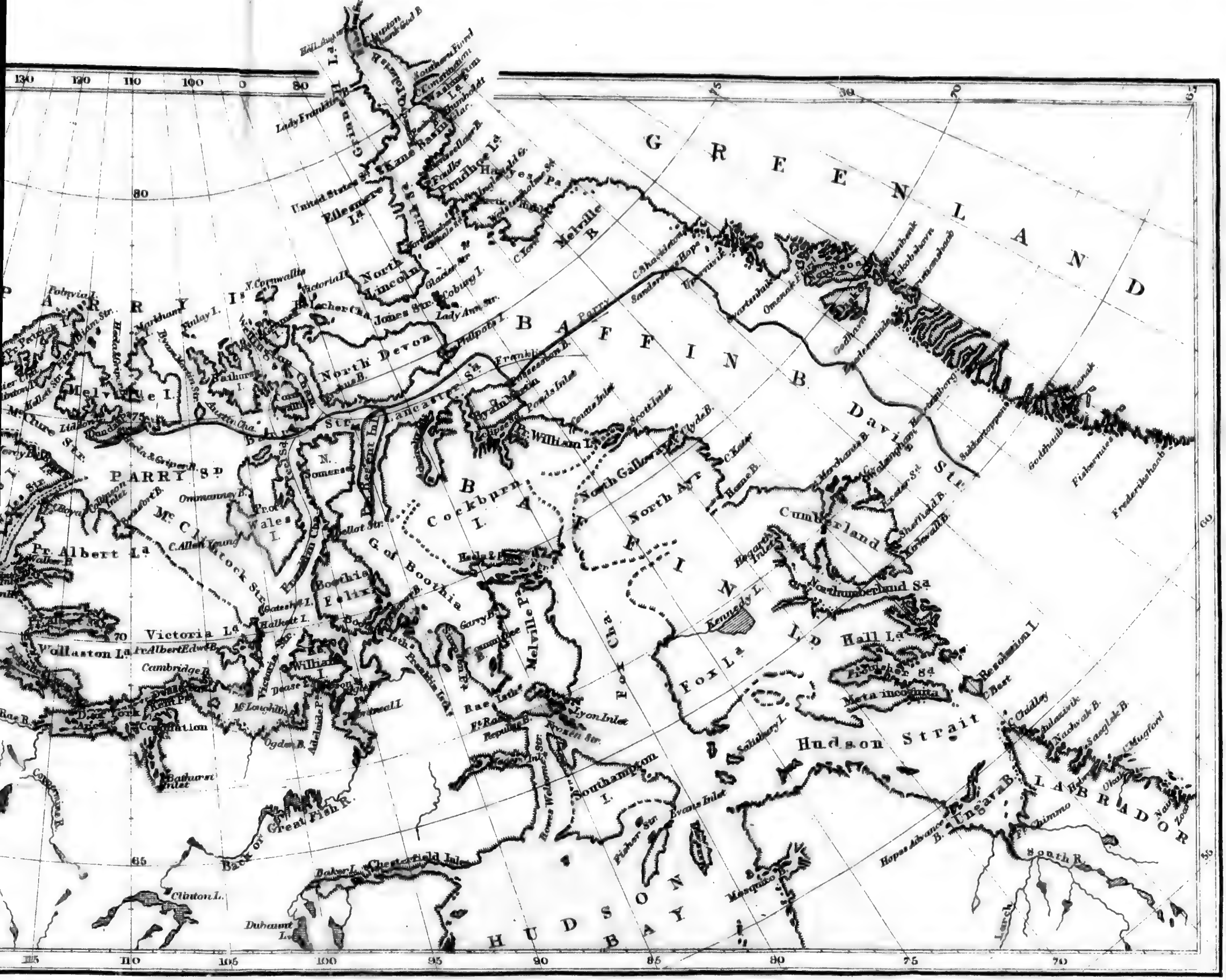




Engraved by John Dower, for "The Threshold of the unknown Region" by C.R. Markham C.B. F.R.S.



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CHAPTER VIII.

BAFFIN'S BAY, AND THE PASSAGE OF THE MIDDLE PACK.

Hitherto our attention has been engaged by the fruitless endeavours of many successive voyagers, during three centuries, to penetrate the mighty Polar pack between Greenland and Novaya Zemlya. The high qualities of the men who were engaged in these attempts, their devoted zeal, their gallant perseverance, their seamanlike work, alone prevent us from becoming wearied with the stories, ever bearing the same burden of an impenetrable ice barrier. It will now be a more pleasant task to examine the voyages up Baffin's Bay, where, through great dangers and hair-breadth escapes, a less formidable pack has for many years been annually encountered, battled with, and overcome. And this annual victory leads to the achievement of a position whence a system of North Polar exploration can be organised, by the only thorough and efficient means—namely, modern Arctic sledge travelling.

The pioneer to this route, the discoverer of the broad strait leading to Baffin's Bay, was that learned navigator and brave seaman John Davis of Sandrudge, in the county of Devon. His undertaking was supported by Sir Adrian Gilbert and many other gentlemen of Devonshire, and his little vessels, the 'Sunshine' (50 tons) and 'Moonshine' (35 tons), sailed from Dartmouth on June 7, 1585. The sight of Greenland was not cheering to the discoverers, for Davis says that 'the lothsome view of this shore, and the irksome noyse of the yce, was such as it bred strange conceites among us,' and he called it 'Desolation.' But his intercourse with the Esquimaux, whom he gratified with music and dancing, was pleasant and satisfactory, and in all respects becoming the character of the good English gentleman, who distributed presents among 'the gentle and loving savages.' He crossed the strait which bears his name, and gave the name of Cape Walsingham to the point on its western side. The second voyage was over much the same ground; but, in his third voyage, in 1587, in the same old 'Sunshine,' Davis pushed farther to the northward, and reached as far as the bold promontory which he named after one of the supporters of the voyage, Hope Sanderson. It is a magnificent headland, 3,300 feet high, to the southward of the Danish colony of Upernavik. Davis thus made known to future mariners, that there was a wide opening in this direction, leading to the northward.

After the voyages of Davis followed the attempts to discover the North-West Passage by the ill-fated John Knight. He went to Greenland in 1605 as captain of a pinnace belonging to the King of Denmark; and on April 18, 1606, he sailed from Gravesend in a bark called the 'Hopewell,' victualled at the cost of the Muscovy and East India merchants. He seems to have made a prosperous voyage across the Atlantic, and to have landed on the coast of Labrador with paper to make a sketch of the coast line. Captain Knight was seen to walk over a hill, but was never heard of again; and the last words in his journal, in a different handwriting, are as follow:—

'Here Mr. Knight ended writinge in his jornall: and this 26 day of June 1606 the said Knight, his mate his brother and 3 others went into their shallop and rowed to an Iland about 6 myle from their ship comeng to the iland the said Knight his mate his brother and . . . went a shore takinge with hym a compas and other instruments to take a plat of the land: also they took with them swords daggs and mũskets and halfe pykes to defend them from the enemyes yf they should meete withe any they went a shore abowt 10 of the clocke in the mornenge comandinge the other 2 whom they lefte in the shallop (whereof the trumpeter was one), to tarry there for them untill 3 a clock in the afternoon: which attendance they performed and stayed untill 11 aclocke at night as they say for neither that night nor at any tyme after notwithstanding they sent a shore agayne and used their best means untill they were assalted by the salvages, could they either see hear or understand what was become of ye said Mr. Knight or the others that went a shore w^{h} hym.'

The ship returned to England, reaching Dartmouth on September 24, 1606. The original manuscript by Captain Knight, being a narrative of this voyage, a brief abstract of which was printed by Purchas,[1] has been saved from the general destruction of similar precious documents at the India Office.[2] It is a brief and sad story, but it is worth preserving, and will, it is hoped, be printed and edited before long.

One vessel only was destined successfully to follow up the discovery of Davis during the next two centuries, and, unfortunately, but very unsatisfactory and vague accounts are extant of her voyage. No blame, however, attaches to the stout pilot William Baffin, who fully described the sounds and islands he discovered on a map now lost. The fault—and it is a serious one—lies at the door of old Purchas, who received the log and chart kept by Baffin, but threw them aside with the remark, that they were 'somewhat troublesome and too costly to insert.' Owing to this misconduct on the part of Purchas we are left to gather what we can from a letter to Sir John Wolstenholme, and from Baffin's own very 'Brief and True Relation or Journall.' From these we learn that the 'Discovery,' of 55 tons, sailed from Gravesend on March 26, 1616, with Robert Bylot as master, William Baffin as pilot, and a crew of fifteen men. The little 'Discovery' reached Hope Sanderson, the extreme northern point of Davis on May 30, and, after a short stoppage by the ice, got into clear water again, and reached the islands in 72° 45′, which he called the Women's Islands, after some Esquimaux fair ones, young and old, whom the mariners treated with much kindness and courtesy. After working up a lane of water between the land and the pack for several days, Baffin was at last stopped by the ice in 74° 15′ N. on June 9. The 'Discovery' made a fortunate passage through the Melville Bay ice, which has since become so famous, and reached the 'North Water' on July 1, a detention of only twenty-two days.

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[1] Purchas his Pilgrimes, Book iv. cap. xvi.

[2] The Directors of the East India and North-West Companies were the same body, and once there must have been many valuable original manuscript journals of Arctic voyages in the archives of the East India Company. For the manuscript of Captain Knight's Journal is marked No. 19. It is the only one that has been rescued from the butter-man.

After discovering the head of the great bay which bears his name, with its wide sounds or openings, Baffin returned by sailing down the west side of it, and the little 'Discovery' was safely anchored in Dover Roads on August 30. It was exactly 200 years before another vessel forced her way into the 'North Water' of Baffin's Bay, and the discoveries of that famous pilot were well-nigh forgotten. On the maps published as late as 1818 we see a circular dotted line to the westward of Greenland, with this legend, 'Baffin's Bay, according to the relation of W. Baffin in 1616, but not now believed.'[1] So the memory of a bold and scientific navigator had to wait many weary years for that full justice which usually comes at last.

Meanwhile, the Dutch opened a whale fishery in Davis Strait in 1719, which proved very remunerative, and comparatively safe, for, in a period of sixty years, out of 6,372 voyages to Davis Strait, only thirty-eight ships were wrecked.[2] English whalers soon began to frequent the same fishery; but, in spite of old Baffin's judicious advice, no vessel ever followed in his track until 1817, and the whales were permitted to remain for two centuries in tranquil enjoyment of the 'North Water.'

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[1] See the map at the beginning of Daines Barrington's book on the North Pole, and many others.

[2] 'Generale Lyst den Straat-Davissche Visschery zedert 't jaar 1719–1775.' (Haarlem, 1778).

It is necessary to describe the usual position of ice and water in Baffin's Bay during the navigable season. A surface current is believed always to be flowing down the bay, bearing vast harvests of ice into the Atlantic, and in the winter and early spring great floes of ice are constantly drifting down in this direction, through the wide openings at the northern end—Lancaster, Jones, and Smith Sounds. In the winter of 1850–51, the American Expedition was drifted with the ice from Wellington Channel to the Atlantic, at the rate of about twelve miles a day. Dr. Kane supposed that at one time the ice extended in an unbroken sheet from Lancaster Sound to Cape Walsingham, with a breadth of 200 miles. This ice averaged a thickness of 8 feet. In September 1855, the 'Resolute,' abandoned far up Barrow's Strait in May 1854, drifted out into the Atlantic; and it is well known how the gallant little 'Fox' underwent the same process in 1857–58. Sir Leopold M'Clintock found a north-westerly wind to be constantly prevailing from September to April, and he believes that the drift is due to the agency of the wind alone. Captain Maury thought that there was an under-current conveying the warm water up the bay, to appear again on the surface, and form lanes and pools of open water far up in the Polar region. The existence of this under-current was conjectured from the fact that majestic icebergs are sometimes seen sailing up the bay, near the southern part of the west coast, in the teeth of wind and surface current. This may, however, be caused by strong tides and counter currents.

The drift of the vast masses of ice to the southward invariably causes the existence of a wide open sheet of navigable water in the upper end of Baffin's Bay, and for some distance within Lancaster and Smith Sounds during the summer and early autumn, which is known as the 'North Water.' But there is a formidable mass of ice between this 'North Water' and Davis Strait, averaging from 170 to 200 miles in width, and blocking up the centre of Baffin's Bay, which interrupts the approach to the north-west end, and is known as the 'Middle pack.' This ice consists of some ancient floe-pieces of great thickness, which may have come from a distant part of the Arctic seas, of a wide extent of ice formed during each winter, about 6 or 8 feet thick, and of those magnificent bergs which compose the principal charm of Melville Bay scenery. An immense quantity of this pack is destroyed every summer either by the thaws or by the swell and warmth of the Atlantic as it drifts south. The ice of Baffin's Bay is far lighter than that of the Spitzbergen sea. On an average the floes in Baffin's Bay are hardly a fourth part of the thickness of those round Spitzbergen. The latter are not unfrequently in single sheets of solid transparent ice, from 20 to 30, or even approaching 40 feet in thickness. In Baffin's Bay the average thickness of the floes is only 5 or 6 feet, pieces of 8 or 10 feet thick being of rare occurrence.

It is curious that, although there was a flourishing whale fishery in Davis Strait, the passage of the Middle pack was never attempted between the years 1616 and 1817. Old Baffin had gallantly led the way to the 'North Water,' and no man had dared to follow him. At last two whalers, the 'Larkins' of Leith, and the 'Elizabeth' of Aberdeen, made the attempt, and successfully passed the barrier in 1817, finding so plentiful a fishery in the 'North Water' of Baffin's Bay that, from that day to this, very few years have passed without whalers forcing the barrier of the middle pack.

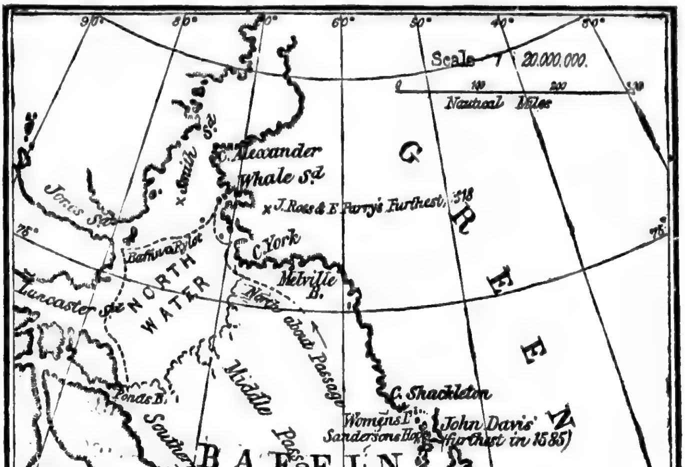
In 1818, the 'Alexander' (252 tons) and 'Isabella' (385 tons) were despatched on an expedition of discovery up Baffin's Bay, by the Government, commanded by John Ross and Edward Parry. They sailed from England on April 18, reached the southern edge of the ice on July 2, and, after a detention of thirty-eight days, reached the 'North Water' on August 8.

The chief merit of this first voyage of John

Ross is, that it vindicated Baffin's claims as a discoverer, and proved that his latitudes were very accurate. Ross, at his farthest point, was too far south to see more than the outline of the land near Smith Sound, but he named the capes on each side of its entrance after his two ships, 'Isabella' and 'Alexander.'

From that time the fleet of whalers pushed for the 'North Water' every summer, and was rewarded by the discovery of a very abundant fishery. No bold mariner had taken the advice of Baffin during 200 years, and the poor whales had found a pleasant retreat in this distant corner of the sea, until they were thus invaded by the modern navigators of the middle pack.

The southern edge of the 'North Water' extends from Pond's Bay on the west side, in a north-westerly direction to Cape York; and there are three routes through the middle pack by which it may be reached. The first and only safe one is called by the whalers the 'North-about Passage' along the Greenland coast; the second is by entering the drifting pack in the centre of the bay. It is called the 'Middle Passage,' and should only be attempted late in the season, when the land ice of Melville Bay is most probably broken up; and the third, called the 'Southern Passage,' is long the west side of Baffin's Bay, and can only be effected very late in the season, or after a long continuance of southerly winds. But



the 'North about passage' may always be successfully performed, if not in June, then in July or August. On the coast of Greenland, between the parallels of 73° and 76°, there is a wide indentation, open to the south, called Melville Bay. The ice formed in it, from the lay of the land, is not exposed to the general drift down Baffin's Bay, and remains firmly fixed to the coast, often extending from it to a distance of thirty to fifty miles. The prevailing winds in the early part of the season are from the north, in which case the drifting pack is blown off shore, and leaves a lane of open water along the land-floe of Melville Bay. When the wind is from the south, the pack drifts into Melville Bay; but in that case the land-floe is a source of protection, for, as the drifting ice presses against it, the land ice, being oldest, almost invariably proves the strongest of the two. A dock can then be cut in the land ice, and a ship may ride in safety, until the pressure eases off. Thus, 'by sticking to this land-floe,' as the whalers say, of Melville Bay, a vessel is never at the mercy of a drifting pack, and though there may frequently be long detention, ground is seldom lost, and final success is the reward of perseverance. The main ice is generally met with off Cape Shackleton or the Woman Islands of Baffin, and the 'North Water' commences at Cape York, a distance of about 170 miles.

The earliest passage into the 'North Water' was accomplished on June 12, 1849, and the average passage of the whalers during twenty-three years was effected on July 13. There is not a single instance, from 1817 to 1849, of some of the whalers having failed to get through, and in the years 1825, 1828, 1832, 1833, and 1834 the whole fleet reached the 'North Water' before the middle of June. It so happens that, unless the whalers can get through so as to reach Pond's Bay in July, it is not worth while to persevere, and they give up the attempt. The navigable season, however, continues until the end of August, so that discovery-ships may always count upon effecting the passage at some period between May and September. The best chance is early in the year, and they should never fail to be at the edge of the ice by the middle of June. Discovery-ships have been sent up Baffin's Bay thirty-eight times since 1818, and only on two occasions have they failed to reach the 'North Water' during the navigable season. One of these failures was experienced by the 'North Star' in 1849; but she did not arrive at the edge of the ice until the end of July, and if she had been earlier in the field she would have succeeded without doubt. This is certain, for in the very same year the 'St. Andrew' of Aberdeen reached the 'North Water' on June 12. The other instance of want of success was in the case of the 'Fox' in 1857, but she was still later in the season, not arriving in Melville Bay until the middle of August.

Had she been earlier she would have succeeded; and when McClintock, with that indomitable perseverance which has been his motto ever since he commenced Arctic exploration, again charged the barrier on June 18 in the following year: he was in the 'North Water' by the 27th.

But Melville Bay used to be a place of dread and anxiety for the whaling fleet; for when a southerly wind brought the drifting pack in violent and irresistible contact with the land-floe, the ships, slowly creeping along its edge, were frequently crushed like so many walnuts. In 1819 as many as fourteen ships were smashed to pieces in this way; in 1821, eleven; and in 1822, seven. The year 1830 was the greater season of disaster for the whalers, when nineteen ships were entirely destroyed, occasioning a total loss to their owners of 142,600*l.* On June 19 a fresh gale from the S.S.W. drove masses of ice into Melville Bay, and nipped the whole fleet against the land-floe, about forty miles to the southward of Cape York. In the evening the gale increased, and the floes began to overlap each other. A huge floe then came down upon the devoted ships, and a scene of indescribable horror ensued. In a quarter of an hour several fine ships were converted into shattered fragments; the ice, with a loud grinding noise, tore open their sides, masts were seen falling in all directions, great ships were squeezed flat and thrown broadside on to the ice, and one whaler, the 'Rattler,' was literally turned inside out. The men only just had time to jump on the ice; but it must be understood that there is little or no danger of loss of life in Melville Bay. The shipwrecked sailors took refuge on board their more fortunate consorts, for even in 1830 the 'Cumbrian' and several other ships escaped by digging deep docks in the land ice. Even if a solitary whaler is destroyed, when no other is in sight, the retreat in boats to the Danish settlements is perfectly safe and easy. When the fearful catastrophe occurred in 1830, there were a thousand men encamped on the ice, the clusters of tents were a scene of joyous dancing and frolic, for Jack had got a holiday, and the season was long remembered as the year of 'Baffin's Fair.'

Discovery-ships are more strongly fortified than whalers; they can endure nips which would prove fatal to any other vessels, and they do not, therefore, run the same risk. The proof of this is, that exploring vessels have passed through the ice of Melville Bay thirty-eight times, and not one has been lost. A good nip merely causes a little pleasurable excitement. The weird beauty of the scenery, the wonderful effects of refraction round the horizon, the brightness of ice and sea and sky, the cutting of docks and blasting and charging of floes, all combine to render the Melville Bay detention a most enjoyable and exhilarating time. Here may be seen those stupendous icebergs which are among the most sublime of Nature's works, with their brilliant emerald and sapphire tints. Here the majestic movements of irresistible floes may be watched, and that still grander sight when a nip causes the formation of a long ridge of ice hummocks, and huge blocks are reared one upon the other amidst a loud grinding moan. The passage of Melville Bay may be a time of anxiety, but he must be dead to all sense of the beautiful in nature who does not derive an equal amount of pleasure from scenes of such unsurpassed grandeur and interest. Skill and judgment in watching the ice and selecting leads are required in this navigation, but an early arrival in Davis Strait ensures the certainty of reaching the 'North Water' during the navigable season.

The average detention for steamers in Melville Bay has been twenty-two days, many of them under exceptionally unfavourable circumstances; and curiously enough this is exactly the time that it took brave old Baffin to cross Melville Bay in 1616, in a little craft of 55 tons. It will be hard indeed if powerful steamers cannot do as well as this 55 ton fly-boat. We may count upon a successful passage of the middle pack from a consideration of the nature of the ice and the physical causes which influence its movements, from the fact that whalers have almost annually reached the 'North Water' since 1817, and from an examination of all former voyages of discovery, in thirty-six of which out of thirty-eight the ice obstructions in Baffin's Bay were overcome.

Once in the 'North Water,' all obstacles to an exploration, more or less extensive, of the Unknown Region are at an end. From Cape York there is invariably a navigable sea to Smith Sound in the summer months.

Of late years steam has made a great change in ice navigation, and the steam whalers are not now exposed to the same risks and detentions as fell to the lot of the old sailing ships. Whale oil was chiefly in demand for lighting streets and houses; and the invention of gas had the effect of lessening the number of ships sent to the north in quest of whale oil. Although never wholly abandoned, the whaling trade fluctuated for many years;[1] until it was found that an Indian fibre, when manipulated with whale oil, could be manufactured into a great variety of useful fabrics. The extension of the manufacture of jute in Dundee caused the revival of the whale fishery in Baffin's Bay. A million bales of jute are now annually imported into Dundee, equal to 143,000 tons; and the bulk of the whale oil is required by the jute manufacturers of Dundee and the neighbourhood. Thus the port of Dundee has now become the centre of the whale-fishing trade; and cargoes of oil from the Arctic regions may be seen discharging alongside of cargoes of jute from Calcutta, both being essential to the prosperity of the port. In 1858 the 'Tay,' a full-rigged ship of 600 tons, was converted into an auxiliary screw whaler, being the first steamer that sailed from Dundee on a whaling voyage. In the following year two new steamers, the 'Dundee' and 'Narwhal,' were built expressly for the seal and whaling trade; and the experience of their voyages fully proved the enormous advantage of steam over sails in ice navi-

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[1] In the Journal of the Statistical Society for 1853 (vol. xvii. p. 34) there are some details of the northern whale fishery from the port of Hull, from 1772 to 1852. In 1772 there were 9 whalers, in 1782 only 3, in 1792 there were 20, in 1802 there were 36, in 1812 there were 49, and 1820 was a very prosperous year. There were 62 whalers, which brought back 7,976 tons, worth 239,280*l.* In 1821 10 Hull vessels were lost. In 1834 there were only 8 whalers, of which 6 were lost. From 1835 to 1845 only one or two vessels were sent out; but in 1846 the trade revived, and 14 whalers were despatched. In 1852 there were 14; but from that time the

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trade dwindled, and now there are no whalers from the port of Hull. The best known of the old Hull whalers were the 'True-love,' (Captain Parker), which made her first voyage in 1784, and was still going in 1852, the 'Manchester' which made 4 voyages, the 'Ellison' and the 'Molly.' From 1772 to 1852 194 whalers sailed from Hull, of which 80 were lost; they brought back 171,907 tons of oil, worth 5,158,080*l.*, and 8,556 tons of bone, worth 1,691,200*l.* Total 6,847,280*l.* The average price of oil was 30*l.* a ton, and of bone 200*l.*

gation. Messrs. Alexander Stephen & Sons, the enterprising Dundee shipbuilders, have since built several other steam whalers, and some of the sailing vessels were fitted with auxiliary screws. By 1867 there was not a sailing vessel belonging to Dundee in the whaling trade. At first there was a question between wood and iron, but it has now been fairly settled in favour of wooden vessels. An iron whaler, called the 'River Tay,' was built at Kirkcaldy, and strengthened in every possible way, but all was of no avail when brought into contact with the ice and cold. She sank on her first trip in Davis Strait, with several of the wooden fleet around her.

The value of the Dundee whaling fleet of ten steamers, with their full equipment of fishing gear, and provisions for a season's voyage, together with the necessary plant in casks and boiling accommodation, may be estimated at 150,000*l.* to 200,000*l.*; and the gross value of the produce of a successful season's fishing in seal-skins, whalebone, and seal and whale oil, at about 100,000*l.*; each of the crew, from the captain to the cabin-boy, having an interest in the success of the voyage, in the shape of oil money.

A whale averages a yield of about ten tons of oil, valued at 40*l.* to 43*l.* a ton; and about twelve hundredweight of whalebone, worth 450*l.* to 500*l.* a ton. At present ten steamers sail from Dundee for Baffin's Bay. Four are owned by the Dundee Seal and Whale Fishing Company—all built by Messrs. Alexander Stephen & Sons, expressly for the trade—namely, the 'Esquimaux,' of 436 tons and 70-horse power, built in 1865, and commanded by Captain Yule, who now sails on his tenth voyage in her; the 'Camperdown,' of nearly the same size, built in 1860, and commanded by Captain Gravill, the son of an old and much-respected whaling captain, and himself an Arctic seaman of long experience; the 'Narwhal,' under Captain Maclellan; and the 'Polynia,' a smaller vessel of 358 tons, built in 1861, and commanded by Captain Kilgour. The 'Victor' and 'Intrepid' are sailing vessels converted into steamers, and belong to the Tay Seal and Whale Fishing Company. They are commanded by Captains Deuchars and Souter. The 'Arctic,' a fine steamer of 439 tons and 70-horse power, built in 1867, was the property of Messrs. Alexander Stephen & Sons, the Dundee shipbuilders. She was commanded by Captain William Adams, a daring and successful ice navigator. The 'Erik,' of 412 tons and 70-horse power, is a well-built, serviceable vessel, built for Messrs. Antony Gibbs and Sons of London in 1864,[1] and now commanded by Captain J. B. Walker, a seaman of sound judgment and long experience. The

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[1] See pp. 144-147.

'Ravenscraig,' a sailing vessel converted into a steamer in 1866, owned by Mr. Lockhart, of Kirkcaldy, is commanded by Captain Bannerman. All the Baffin's Bay whalers are well strengthened for ice navigation, and have iron stem-plates, with iron ice-plates carried round the bows, and iron side-plates. They are also strongly fortified and staunched inboard; while the outside planking is covered with a doubling of iron bark[1] from the load line down to the bilge. Their stems have considerable rake, so that they can charge the ice at full speed, rise to it 6 or 8 feet, and then come down upon it with crushing force.[2] Thus the whole system of ice navigation is very different from what it was in the old days of sailing vessels; and now it is very seldom that the whaling fleet does not pass through Melville Bay in good time, so as to have a spare month or six weeks in the 'North Water.' Most of the whaling steamers are ship rigged. Each carries eight whale boats about 25 feet long, manned by nearly the whole crew of sixty men; for very few remain on board when the cry of 'A fall! a fall!' is heard.

It is to be regretted that more pains have not hitherto been taken to collect the information, year by year, which is acquired by the daring and intelligent commanders of the whalers, and which they are so ready to communicate. In 1871 Captain Walker took the 'Erik' up Eclipse Sound and found coal, washed down by one of the rivers. In 1872 Captain Adams took the 'Arctic' from Pond's Inlet, by Eclipse Sound and Navy Board Inlet, into Barrow's Strait, and then went up Admiralty Inlet. In the same year Captain Edwards took the 'Victor' some distance up Admiralty Inlet. Discoveries are thus constantly made, and generally plotted on charts with care; and all that is needed for the utilisation of these valuable observations, year by year, is the establishment of a system such as Professor Mohn, of Christiania, has inaugurated with excellent effect in Norway; through which commanders may be induced to record careful observations on every opportunity, and to report them. The knowledge that such observations are valued and appreciated will always be a sufficient inducement.

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[1] The hardest wood known, imported from Australia.

[2] I am indebted for the detailed information respecting the present Dundee whaling fleet to the courtesy of Mr. Yeaman of that town, and to Mr. David Bruce, the manager of the Dundee Seal and Whale Fishing Company.

The first whaler to sail from Dundee, in the season of 1873, was the 'Intrepid,' which left the Tay on April 30. Most of the others followed on May 1. The 2nd was a Friday; but on the 3rd the 'Arctic' sailed, under the command of Captain Adams, with sixty hands on board. Among them was Commander A. H. Markham, R.N., as a passenger, who proceeded to Baffin's Bay to acquire a knowledge of all details connected with a whaling voyage and experience in ice navigation; to learn how these steamers are handled in the ice; to see the bergs and fiords of Greenland, and the 'North Water' with its straits leading to the vast Unknown Region; to examine the little-known harbours and inlets to the westward; to collect, note, and observe with watchful accuracy. Next followed the 'Erik,' under Captain Walker, taking with him a young sportsman, Mr. Rickaby, who wished to make acquaintance with the bears, looms, and dovekeys.

Captain Markham's voyage in the 'Arctic' was an important result of the Arctic campaign of 1873. Since the publication of Scoresby's voyage in 1820, we have had no full account of the English whale fishery from one who was actually engaged in it; and there have been great changes during the 55 years that have elapsed. We, therefore, have a really valuable addition to our knowledge of Arctic matters in Captain Markham's interesting narrative of his whaling cruise in Baffin's Bay.[1] That officer carefully noted all the details of the whale fishery, sharing in the labours and risks, taking the steer oar in the chase after whales, and assisting in the capture of bears and narwhals. He acquired practical experience in the new methods of handling ships in the ice, and saw for himself of what the ironclad bows of a screw steamer are capable, in forcing a way through a pack. His voyage was unusually extended, for the 'Arctic' was the first whaler to penetrate down Prince Regent's Inlet to the Gulf of Boothia. She thus went beyond the furthest points reached by Sir Edward Parry's Expedition in 1824, by Sir James Ross's Expedition in 1848, by Mr. Saunders in the 'North Star' in 1850, by Captain Forsyth in 1850, by Mr. Kennedy in 1851, and within a few miles of that reached by Sir Leopold McClintock in 1858. This is a remarkable exemplification of the improvement which the use of sharp bowed powerful steamers has introduced in ice navigation. A further striking proof of the change is afforded by the fact that the 'Arctic' passed through Melville Bay in sixty hours, while the expeditions of former days, consisting of sailing vessels, were usually detained there for several weeks.

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[1] 'A Whaling Cruise to Baffin's Bay and the Gulf of Boothia, and an account of the rescue of the crew of the "Polaris," by Albert H. Markham, F.R.G.S., Commander, Royal Navy. With an Introduction by Rear-Admiral Sherard Osborn, C.B., F.R.S.' (Sampson Low and Co., 1874).

Captain Markham made several corrections in the charts, especially in Cresswell Bay, and round Cape Garry at the entrance of the Gulf of Boothia, fixing the position of that cape with accuracy. He also visited Port Leopold and Fury Beach, examining the stores left there by Ross and Parry, and observing how wonderfully they had been preserved. The season of 1873 was a successful one for the Dundee whaling fleet. The 'Arctic' caught 28 whales yielding 260 tons, and the others, though not so fortunate, returned with good cargoes.

During the year 1874 the ten Dundee whalers were again very successful, and one Peterhead whaler, the 'Mazanthien,' also went up Baffin's Bay. The 'Arctic,' again under the command of Captain Adams, sailed from Dundee on April 28, 1874, reaching the land ice of Melville Bay on May 30. Here the whalers assembled, but they had not long to wait. This once formidable obstacle which, in the days of sailing vessels, used to cause a detention of weeks and even months, no longer forms a barrier to progress. The whole whaling fleet passed through Melville Bay in two days, and again demonstrated the wonderful improvement which steam has caused in ice navigation. After reaching the 'North Water,' Captain Adams met with great success, and by July 2 there were twelve heavy fish on board, yielding 150 tons of oil and ten of whalebone. The 'Arctic' then went up Lancaster Sound, and entered Prince Regent's Inlet, where five more whales were taken. Captain Adams then put into Elwyn Inlet, where a large number of white whales were seen in the shoal water, and thirty-two were taken, yielding six tons of oil and two tons of valuable skins. On July 30 the 'Arctic' had gone up Regent's Inlet as far as the south point of Cresswell Bay, where she was stopped by ice; and on August 2 she was off Cape Garry, with several other whalers in company. Afterwards Captain Adams again steamed up the Gulf of Boothia as far as Brentford Bay and Cape Scoresby. The ice was then closing in upon the land, the weather being calm, and the 'Arctic,' 'Intrepid,' and 'Victor,' began to steam down the inlet. The 'Arctic' got as far as Fury Beach, when she was closely beset, in company with the 'Camperdown,' 'Victor,' 'Narwhal,' and 'Intrepid;' and on the 7th a strong gale began to blow from the S.S.E. The ice in which the 'Arctic' was beset drifted until it was brought up on Cape Garry, near the shoal water which was sounded and laid down on the chart by Captain Markham in 1873. Then the seaward ice began to crush heavily upon the ship, and at nine she was hove on her beam ends against the grounded pack. It was discovered that she was making water rapidly, the port bow having been stove in. The water gained rapidly on the pumps, and soon the fires in the engine-room were put out.

All hands were then set to work to save clothes and provisions. The ship was now held up merely by the pressure of the ice; and at 7 P.M. she took fire, probably from the galley forward. The flames rapidly spread, and, when they were at their height, the ice opened and the wreck went down stern first. Such has been the end of the good ship 'Arctic;' after a long and exceptionally successful career. She had made eight most remunerative voyages, and had repaid the cost of construction over and over again. In 1873 she made a memorable voyage; returning with the fullest cargo ever known, and with the officers and crew of the rescued 'Polaris.' It was then, too, that Captain Markham made his voyage for the purpose of acquiring a knowledge of ice navigation, the results of which were given to the world in his 'Whaling Cruise to Baffin's Bay.' Thus the 'Arctic' had done right good service in her day. She was lost through one of those casualties which the best seamanship cannot always prevent, but which the use of steam has, in these days, rendered of very rare occurrence.

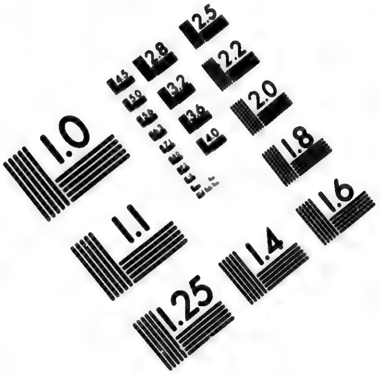
It should be remembered, that while in other seas, such casualties usually involve a terrible loss of life, as well as of property, in the Arctic Regions the very ice which causes the destruction of the ship ensures the safety of the crew. Captain Adams and his fifty-four men were exposed to much hardship, passing the night under a heavy storm of rain, until two tents were erected; and on the 8th they were divided among the four ships within reach. The other ships had experienced severe nips, and the crews got provisions and clothes upon the ice.

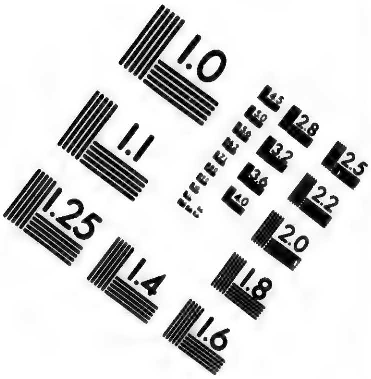
The 'Victor' being full, eventually received Captain Adams and all his men on board, and returned to Dundee; where a new and larger 'Arctic' is on the stocks. Captain Kilgour, in the 'Polynia,' went up Lancaster Sound, and caught as many as ten whales off Cape York, at the entrance of Prince Regent's Inlet, between the 10th and 12th of July. On the 26th Captain Kilgour landed in Batty Bay, and discovered the cairn containing the records, which were left there by Mr. Kennedy on August the 6th, 1852, when in command of Lady Franklin's search-vessel, the 'Prince Albert.' The records, with a sledge, a stove, two ice-knives, and other articles found on the south side of the bay, where the 'Prince Albert' wintered, have been brought to Dundee.

On August 3 the 'Polynia' reached Bellot Strait, and was made fast to the land-ice off Long Island, where several whales were seen. This was the first time that any whaler had penetrated so far down the Gulf of Boothia, and the 'Polynia' thus reached the farthest point attained by Sir Leopold McClintock, in the 'Fox,' in 1859. The 'Polynia' was beset off Cape Scoresby, and again at the entrance of Cresswell Bay, where she was in considerable danger, and experienced some severe nips, which made it necessary to heel her over, in order to caulk the leaks, chiefly near the water-line. This was successfully done off Cape Kater, and the 'Polynia,' after an eventful and very successful cruise, arrived safely at Dundee in November.

The whole of the fleet, except the 'Esquimaux' and 'Active,' went down Prince Regent's Inlet, as far as Cresswell Bay, where the ice came in upon them, and they were all severely nipped. The 'Ravenscraig,' commanded by Captain Bannerman, was beset for nearly three weeks, and was in great danger. This is the first time that Captain Bannerman has commanded a ship. He was first mate of the 'Arctic' last year, when Captain Markham was on board, who was struck by his energy and fine seamanlike qualities. The 'Erik,' commanded by Captain Walker, among others, was beset in Cresswell Bay, and drifted as far as abreast of Bellot Strait. The nips were so severe that she was several times lifted 3 or 4 feet out of the water. She got clear at the same time as the 'Polynia.'

The Arctic fleet, with the exception of the





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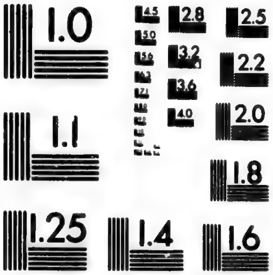

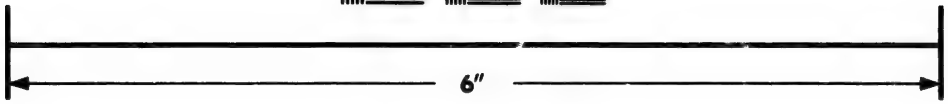

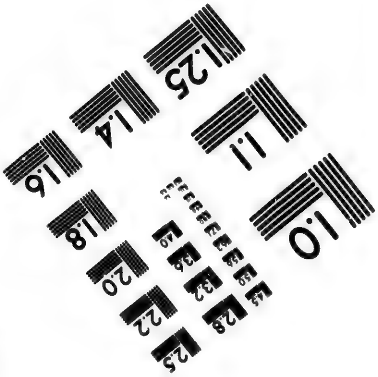

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'Arctic,' returned safely to Dundee, in the autumn of 1874, after a very successful year.[1]

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[1]	Whales	Tons of Oil	Tons of Bone
'Active' (Capt. Fairweather)	25	160	9
'Victor' (Capt. Deuchars)	24	155	8
'Esquimaux' (Capt. Yule)	16	135	6
'Camperdown' (Capt. Gravill)	32	175	9
'Narwhal' (Capt. M'Lennan)	8	95	5½
'Polynia' (Capt. Kilgour)	18	155	8
'Ravenscraig' (Capt. Bannerman)	16	130	6
'Intrepid' (Capt. Soutar)	24	185	10
'Erik' (Capt. Walker)	11	100	5
	174	1290	66½

The price of whale oil is 40*l.* a ton, and of bone 540*l.* a ton. At these prices the oil taken in 1874 is worth 51,600*l.*, and the bone 35,910*l.*, giving a total of 87,510*l.* The following is the result of the whale fishing since 1865:—

	No. of Ships	Oil	Bone
1865	7	630	30
1866	11	340	18
1867	11	20	—
1868	13	970	50
1869	10	140	7½
1870	6	760	40½
1871	8	1,165	61½
1872	10	1,010	54
1873	10	1,352	69
1874	10	1,290	66½

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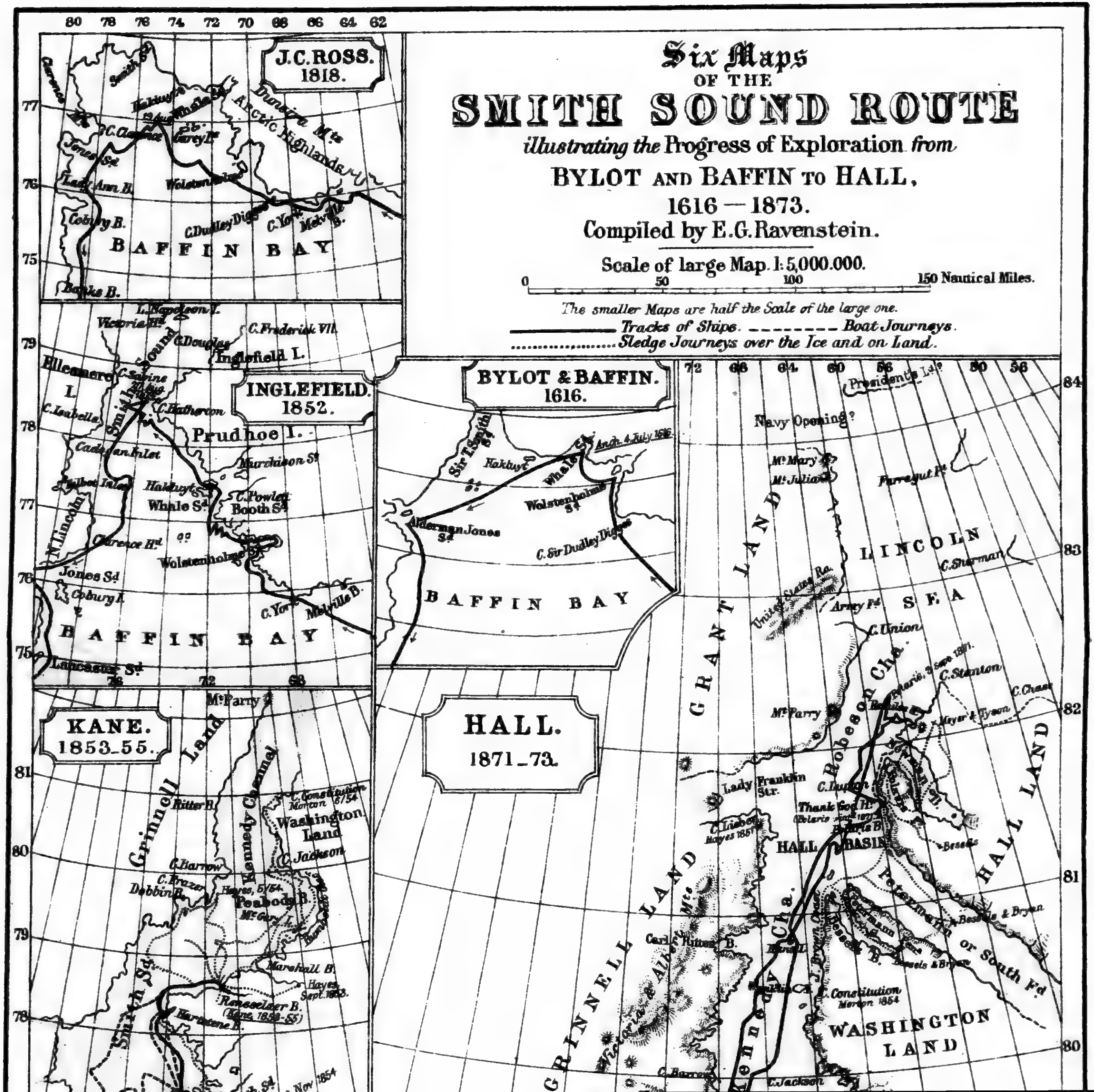


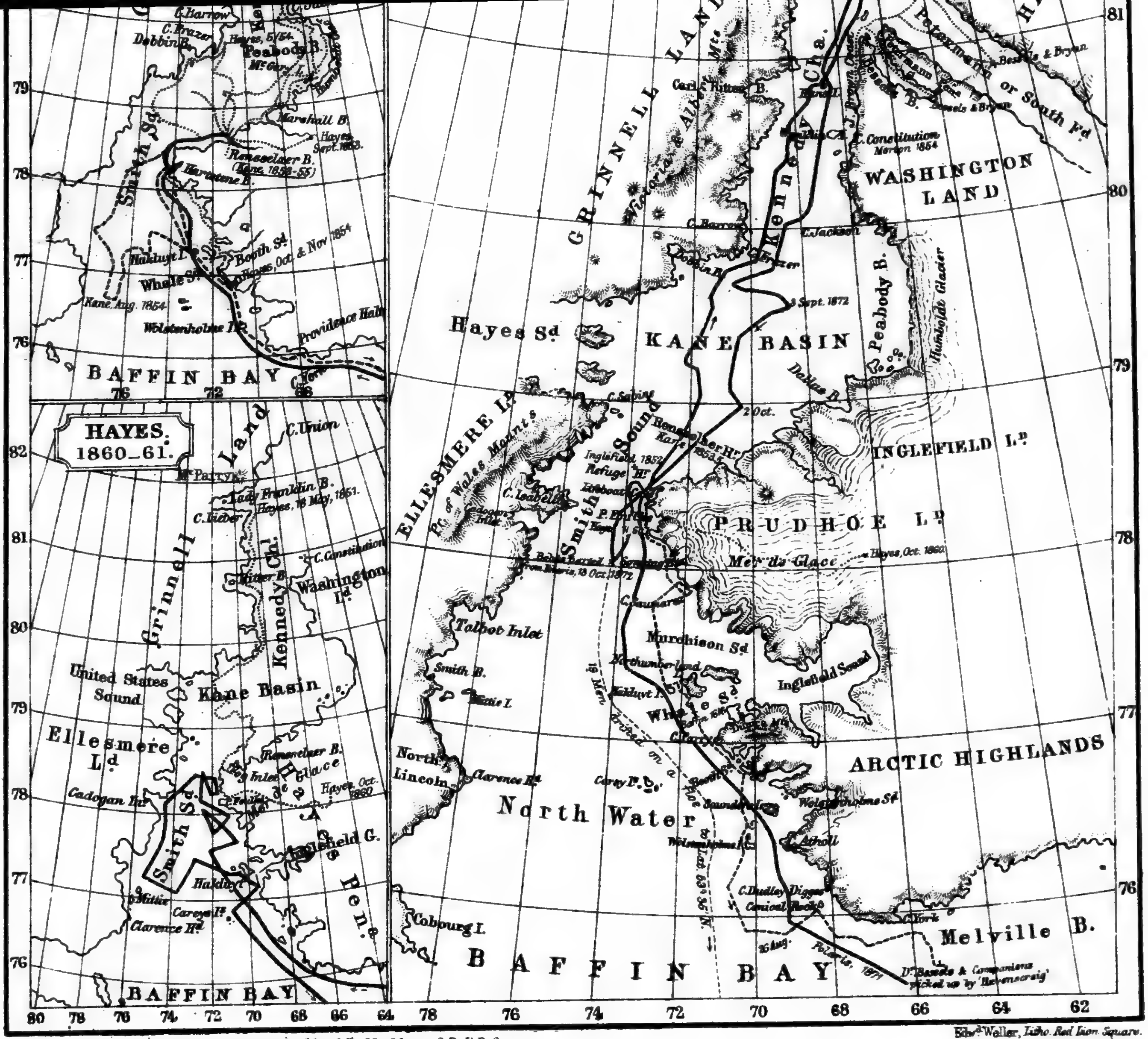
Six Maps OF THE SMITH SOUND ROUTE

illustrating the Progress of Exploration *from*
BYLOT AND BAFFIN TO HALL,
1616 — 1873.
Compiled by E. G. Ravenstein.

Scale of large Map 1:5,000.000.

The smaller Maps are half the Scale of the large one.

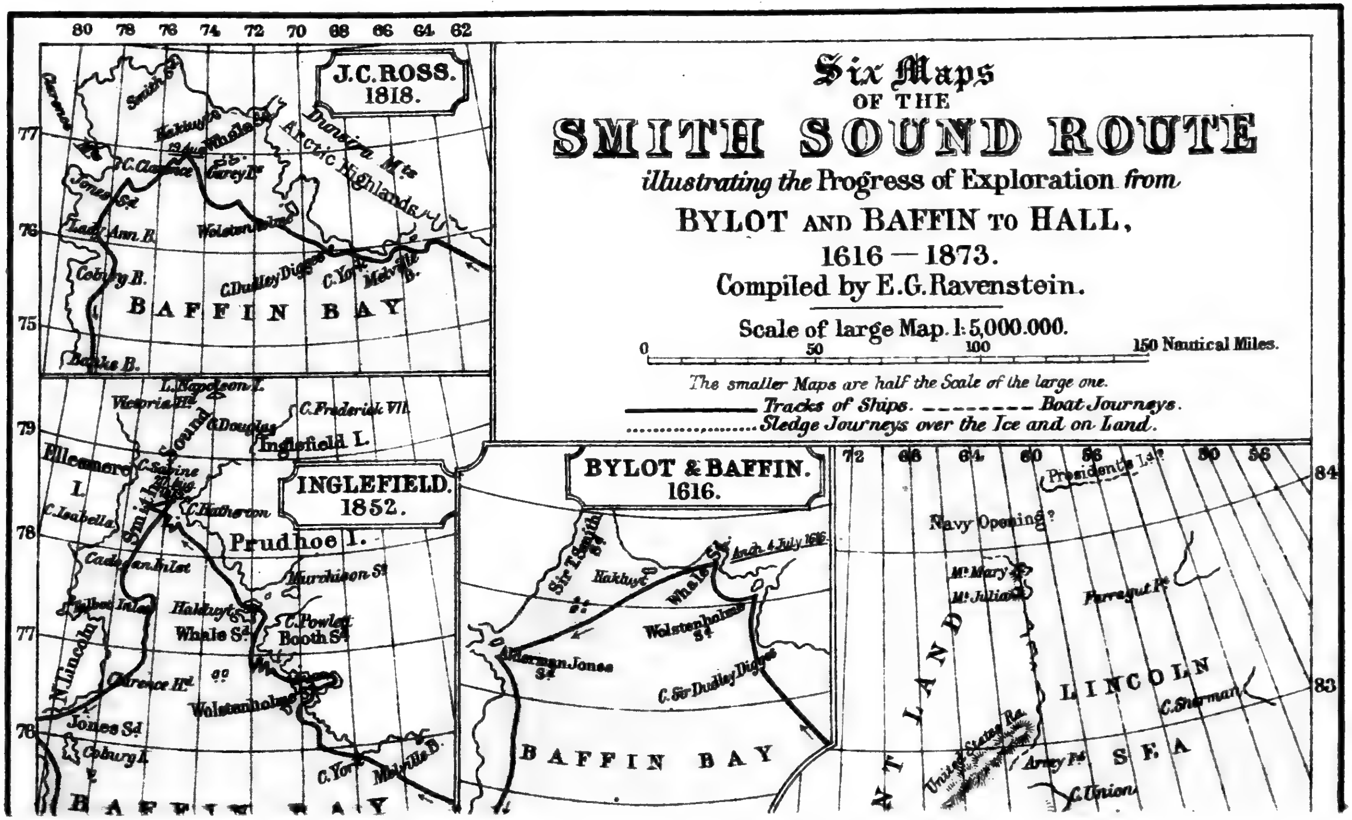
Tracks of Ships. Boat Journeys. Sledge Journeys over the Ice and on Land.



For "The Threshold of the unknown Region" by C. R. Markham, C. B. F. R. S.

Edwd. Weller, Litho. Red Lion Square.

London, Sampson Low, Marston, Low & Searle. 188 Fleet Street



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CHAPTER IX.

SMITH SOUND.

On July 6, 1616, Baffin made the chief discovery of his voyage; namely, the entrance of 'the greatest and largest sound in all this bay.' It is the portal leading north into the vast Unknown Region, and the only point in the whole circuit of the 80th parallel where lines of coast are known to stretch away towards the Pole. Baffin gave it a very common name; but the worshipful person from whom Smith Sound derives its name was no common man. Sir Thomas Smith was the life and soul of the East India Company during the first years of its existence. He was its first governor, and he continued to hold that office for many years. When, in October 1614 he excused himself from holding office longer on account of his age and failing health, he was, nevertheless, unanimously elected. He procured both the first and second patents of incorporation for the East India Company, in 1600 and 1609. Not only did he superintend the outfit of the early voyages to

India, and patronise those of Hudson and Baffin, but he subscribed to them largely out of his own means. In 1612 he was appointed the first Governor of the Company of Merchants Discoverers of the North-West Passage. He fostered the early efforts of that mighty Company which afterwards founded an empire. His excellent advice and constant supervision ensured the preservation of order and good faith among the numerous servants of the Company. He anxiously sought out the best remedies against tropical diseases, and even stooped to interest himself in the amusements of the sailors. He bought virginals for the Company's ships, which is a 'delightful sight for the jacks to skip up and down in such manner as they will.'

Such was the man who gave his name to Smith Sound. All that Baffin tells us concerning it is comprised in the following words:—'It runneth to the north of 78°, and is admirable in one respect, because in it is the greatest variation of the compass of any part of the world known; for, by divers good observations, I found it to be above five points or 66° varied to the westward, so that N.E. by E. is true north, and so of the rest. Also this Sound seemeth to be good for the killing of whales, it being the greatest and largest in all this bay.'

An interesting tribe of Esquimaux had lived on its shores for centuries; but no European verified the discovery of Baffin until August 1818, when Ross and Parry, in the 'Isabella' and 'Alexander,' saw the land at the head of the bay from a very great distance, and Ross named the two capes at the entrance of Smith Sound after his two discovery ships. Whalers may have sighted and even entered Smith Sound since the voyage of Ross; indeed, this is very probable when we consider that they have annually frequented the 'North Water' since 1817, and that there is no difficulty in sailing from Cape York to Cape Isabella in August. We saw the land on each side of Smith Sound from the crow's nest of the 'Assistance' in August 1851, when she was north of Carey Islands; and in 1853, Captain Inglefield went just within Capes Isabella and Alexander, but did not land.

After passing through Melville Bay without any detention from the ice, the little steamer 'Isabel' (149 tons, 16 H.P.), commanded by Captain Inglefield, reached Cape Alexander on August 26, 1852; and, on rounding it, an open sea was seen to stretch through seven points of the compass, apparently unencumbered with ice, though bounded on east and west by two distinct headlands. The entrance of Smith Sound was found to be 36 miles across; but, after naming twenty-four points of land and islets far and near, Captain Inglefield bore up on the 27th, and steered south again without landing, owing to a gale of wind having sprung up. His extreme northern point was 78° 28′ 21″ N.

Baffin had discovered Smith Sound in 1616, but no civilised man explored it or landed on its shores until the year 1853, when Dr. Kane, in the little brig 'Advance' of 120 tons, undertook to lead an American expedition to these far northern regions. But Baron Wrangell, the great Russian Arctic explorer, had, in 1847, recommended the route by Smith Sound as the best for polar discovery, and had made detailed suggestions with reference to the equipment of an expedition.[1] Like Baffin's little 'Discovery,' the 'Advance' only had a crew of seventeen men, and she was but poorly provided for an Arctic winter. She was supplied with no proper sledge equipment, no preserved meats, and only coals for one year; and the sufferings of her gallant little crew afford no argument against Arctic enterprise, any more than do those of Sir Hugh Willoughby. A poisonous dietary of salt meat in a dirty crowded little brig inevitably causes scurvy and debility; while liberal diet, warm clothing, and ventilation ensure such vigorous and enjoyable health and strength in the Arctic regions as is known in no other climate in the world.

Dr. Kane's plan was to push his little brig to the furthest navigable point up Smith Sound, and winter there; then to follow the coast line with sledges until he reached the Polar Basin of theorists, and finally to embark upon its imaginary waters in gutta-percha boats. After reaching the edge of the ice in Baffin's Bay, the 'Advance' took the pack, and had the luck to reach the 'North Water' in ten days. On August 7, 1853, she entered Smith Sound, and passed the highest point reached by Captain Inglefield in the previous year. But in latitude 78° 45′ N., only 17 miles north of Inglefield's position, Dr. Kane was stopped by ice. The coast consists of precipitous cliffs, 800 to 1,200 feet in height, and at their base there was a belt of ice about 18 feet thick, resting on the beach. Dr. Kane adopted the Danish name of *Ice-foot* (*eise fod*) for this permanent frozen ridge. The pack was drifting south, and many icebergs were moving up and down with the tides. After a gallant but ineffectual attempt to force his way through the pack to the northward, the young ice began to form, and on September 10 the 'Advance' was frozen in on the east side of Smith Sound, in latitude 78° 37′ N., longitude 70° 40′ W. The place was named Van Rensselaer Harbour. The sun was 120 days below the horizon. The lowest temperature was in February, when —70° was registered. Until the end of November, parties were employed in laying out depôts to the northward, for the spring travelling. The travelling parties, however, effected little, owing to the small number of hands, and to sickness; but at the same time some interesting discoveries were made.

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[1] 'Journal of the Royal Geographical Society, xviii. p. 19.

Cape Alexander, at the entrance of Smith Sound, was found to be in 78° 10′ N.; and a little farther north the coast of Greenland trends in an easterly direction, and is broken by two large bays full of islands. Precipices rise up to a height of 800 to 1,400 feet from the frozen sea, formed of Old Red Sandstone and Silurian limestone, resting on syenite. In latitude 79° 12′ N., a great glacier abuts upon the sea, presenting a perpendicular face of from 300 to 500 feet. Icebergs are ejected from it in lines, and are described by Dr. Kane as conferring a character of great sublimity on the landscape. This vast mass of ice, with a sea face 45 miles long, was named the Humboldt Glacier. Here Dr. Kane's personal investigations ceased. His steward, a man named Morton, with an Esquimaux and a team of dogs, crossed the front of the glacier, and advanced along a part of the coast to the northward. According to Morton's own account, he went 76 miles farther north, and found open water extending in an iceless channel to the western shores. At his extreme northern point, Morton said he came to a high cliff, where a heavy surf was beating against the rocks. He gave the latitude of this cliff as 81° 22′ N., and declared that he saw the western coast stretching far towards the north, with an iceless horizon, and a heavy swell rolling in with white caps. Crowds of birds were seen thronging the water of this alleged open sea, which was separated from the 'North Water' of Baffin's Bay by a belt of ice 125 miles wide. This was in June 1854. Morton added that the furthest point seen to the northward was a high mountain in about 82° 30′ N., called by Dr. Kane Cape Parry. Another party explored a portion of the western coast of Smith Sound. Dr. Kane gave the name of Kennedy Channel to the northern end of Smith Sound or Strait.

Mr. Arrowsmith has placed Morton's furthest point reached in 80° 56′ N., and his furthest point seen in 81° 56′ N. That eminent Danish geographer, Dr. Henry Rink, has expressed well-founded doubts of the accuracy of Morton's statements, and has shown that the conclusions derived from them are untenable. Dr. Rink is the highest authority on Greenland geography, and he derived his information from Petersen, the interpreter of Kane's expedition, who received the account of the Esquimaux Hans, Morton's companion. From this unbiassed witness, it appears that the 'Open Polar Sea' of Morton was merely a channel cut by the strong current during the warm days of midsummer. Dr. Kane mentions that great numbers of seals and sea-fowl were seen by Morton, and adduces this as a proof of an open Polar sea; but Rink remarks, on the contrary, that the flocking together of sea-animals and birds is a sign of a single opening in a sea, the rest of which was covered with ice.

In July 1854, an unsuccessful attempt was made by Dr. Kane to communicate, by boats, with the English exploring ships up Wellington Channel, and his return showed that the ill-provided crew must face another winter. Reduced to a salt diet which was absolute poison, and with fuel nearly used up, their only chance was to adopt the habits and dress of the Esquimaux as closely as possible, and to rely for food on the success of hunting parties. The tribe of Arctic Highlanders proved real friends in need, and supplied the poor Americans with raw seal and walrus flesh, thus, no doubt, saving their lives. But scurvy soon attacked the whole party, and Dr. Kane with one other man alone remained to attend upon the sick, and perform all the work. During this time the kindly Esquimaux shared with the scurvy-stricken white men the proceeds of their hunting. Half the brig having been burnt for fuel, and all provisions being nearly spent, Dr. Kane abandoned her on May 17, 1855, and the little party commenced their retreat to the Danish settlement of Upernavik. The Esquimaux brought the poor fellows daily supplies of birds, helped them to carry their provisions, and showed the kindest feeling and the most rigid honesty. On June 18 the Americans reached open water, and their kind-hearted saviours bade them farewell at the edge of the floe. Depending entirely on the birds they could shoot for subsistence, the worn-out and debilitated party reached the Danish settlement of Upernavik on August 6, 1855, eighty-three days after abandoning the brig.

The story of the hardships and sufferings of this American party is very interesting as told in the charming volumes of Dr. Kane; but, at the same time, it is quite clear that the nature of the equipment of the poor little 'Advance' rendered them inevitable. She was totally unprepared for two winters in any part of the Arctic regions; and it would be as absurd and irrelevant to found any argument on her experiences as on those of Arnbiœrn the Norman or of Sir Hugh Willoughby. Dr. Kane's discoveries, however, are important. They prove that a wide strait leads from Baffin's Bay into the unknown Polar region; that Greenland is separated from the land to the westward; and that the coast line extends for a considerable distance to the northward. The latter fact is the more important, because this is the only point where the land trends in the direction of the Pole itself, instead of forming a circle of continent and archipelago round the frontier of the Polar region. The open water seen by Morton, in the end of June, was just such a water-hole as forms in almost all parts of the Arctic regions during the navigable season. It may have been as extensive as the 'North Water' at the head of Baffin's Bay, or it may only have extended to the point reached by Morton's vision; but, under either circumstance, there is nothing remarkable in meeting with a water-hole, or *Polynia*, as the Russians would call it, caused by a strong current, in this latitude, in the month of June. It must of course be the resort of innumerable birds and seals during the summer months. During Kane's detention in Smith Sound, his Danish interpreter, Petersen, conversed with the Esquimaux who had been to a large island called *Umingmuk* (musk ox) Isle, far beyond Morton's furthest. They said that there was open water, with walrus there; and that some of their people formerly lived on the island.

On July 10, 1860, Dr. Hayes sailed from Boston, in the schooner 'United States,' of 133 tons, with a crew of fifteen men, with the object of following up the line of research opened by Dr. Kane. On August 27 the schooner entered Smith Sound, but she was blown out of it again no less than three times by heavy gales before Dr. Hayes effected a permanent lodgment within the strait. He wintered in a harbour named Port Foulke, 10 miles N.E. of Cape Alexander, in latitude 78° 17′ 41″ N., and 20 miles south of Kane's winter quarters in Rensselaer Harbour, though the distance by the coast is about 90 miles. On April 4, 1861, Dr. Hayes commenced his sledge travelling with twelve men and fourteen dogs, a metallic life-boat on runners, and provisions for seven persons for five months, and for six persons and fourteen dogs for six weeks. The attempt to drag the life-boat over the ice to the supposed open water in Kennedy Channel proved impracticable; so, sending it back with the main party, Dr. Hayes pressed onward with three companions and two dog-sledges. They reached the west coast of the Sound on May 10, and continued to travel northward until the 18th, when their provisions were exhausted, and they were obliged to return, having reached a latitude of 81° 35′ N. The schooner was broken out of the ice on July 10, and returned safely to Boston again on October 23, 1861. There appears to have been a great abundance of animal life at the winter quarters in Foulke Harbour. Dr. Hayes reported that upwards of 200 reindeer were shot during the winter, that walrus and seals were abundant, and that in the summer there were quantities of ducks and little auks, so that he had no difficulty in constantly supplying his party with fresh food. To this he attributes their entire exemption from disease.

Dr. Hayes examined the west coast of Smith Sound and Kennedy Channel for some distance, and discovered a new sound or channel opening westward from the centre of Smith Sound. He found the portion of Kennedy Channel, which Morton reported to be an open sea in June 1854, entirely frozen over on May 23, 1861; but the ice was everywhere much decayed. The coast on the west side of the channel was lined with a heavy ridge of pressed-up ice, some of the masses being 60 feet high and far up on the beach, and he judged from this that they must have been forced up by ice-fields of great extent, coming down under the influence of winds and currents from a vast ocean to the northward. This theory, however, is quite unnecessary to account for the heavy ice. When H.M.S. 'Assistance' was severely nipped up Barrow's Strait, in 1850, the ice-hummocks were quite as high, and the pressure that formed them was from ice-fields of no great extent.

Two English whalers, in different years, have since been to the entrance of Smith Sound; and saw an open navigable sea, extending to the horizon.

The great success of the voyage of the 'Polaris,' under the command of Captain Hall—a full account of which has been given by Captain Markham[1]—is most encouraging with reference to future exploration in the same direction. Considering the inadequate means at his disposal, and the absence of naval discipline, Captain Hall's success is very remarkable, and shows how much important work may almost certainly be done by a thoroughly equipped naval expedition.

Captain Hall, in 1869, returned from an expedition of five consecutive years in the Arctic regions, during which he lived like one of the Esquimaux, inured himself to their mode of life, and acquired their language. During that long period he was engaged in an earnest endeavour to collect additional particulars respecting the fate of Sir John Franklin's expedition; and he undoubtedly discovered the site of Sir Martin Frobisher's settlement. He brought away many interesting relics; and he received full credit for his discovery from Admiral Collinson, when that distinguished Arctic officer edited the Voyages of Frobisher for the Hakluyt Society.

Early in 1870 Captain Hall began his agitation for the despatch of an expedition to reach the North Pole. He appears to have received much assistance from Mr. Robeson, the American Secretary of the Navy, and the Department handed over to him a wooden river gunboat of 387 tons, called the 'Periwinkle,' which was re-christened the 'Polaris.' Congress also granted him 50,000 dollars; but no naval officer accompanied the expedition. Captain Hall was not himself a seaman, so he took with him Captain S. O. Buddington, a native of New London, in Connecticut, as sailing master. Captain Buddington is now forty-eight years of age, and had made thirteen whaling voyages to Baffin's Bay before he sailed in the 'Polaris.' Captain George E. Tyson joined as assistant navigator; Chester, the mate, was a good seaman and excellent harpooneer; Doctor Bessels, a naturalist and Doctor of Medicine, had charge of the scientific department, and Mr. Meyer went out as meteorologist. Morton, Dr. Kane's ship's steward, Hans, the Esquimaux, who was in the expeditions of Kane and Hayes, and Joe and Hannah, the Esquimaux whom Hall had brought home with him from his former wanderings, with their daughter Silvia, were also of the party. On June 26, 1871, Captain Hall was received by the American Geographical Society at New York, when he announced his intention of proceeding up Jones Sound unless he was stopped by heavy pack-ice, in which case he would pursue Dr. Kane's route by Smith Sound, attempting it by the west side. He gathered from the narratives of Kane and Hayes, that, owing to the configuration of the land, the icebergs, from the glaciers to the north blocked up the deep bay on the east side of Smith Sound, and obstructed navigation. He trusted mainly to dogs for his sledge travelling, and had no hope of reaching a higher latitude than 80° N. in one year.

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[1] See 'Whaling Cruise to Baffin's Bay,' chap. xiii.

The result exceeded his most sanguine expectations. On the occasion of his reception by the American Geographical Society, Mr. Grinnell, the munificent promoter of expeditions for the search of Franklin, presented Captain Hall with the flag which, in 1838, had been with Wilkes to the Antarctic regions, and which had since been in the northern Polar seas, with De Haven, Kane, and Hayes. 'Now I give it to you, sir,' said Mr. Grinnell; 'take it to the North Pole, and bring it back in a year from next October.'

A few days after this reception the 'Polaris' sailed, and, after filling up with provisions at Disco, finally left the most northern Danish settlement on the Greenland coast in August 1871. Captain Hall appears to have abandoned his intention of entering Jones Sound, and pushed for the more northern opening. He carried out his intention of keeping on the western shore of Smith Sound in pushing northwards, and was most successful. He took the 'Polaris' a distance of 250 miles up the strait leading to the North Pole, and reached a higher latitude than had ever before been obtained by any ship, and within 30 miles of the most northern point ever reached by civilised man. An examination of the maps at the commencement of this chapter will show the true significance of his achievement. The first of the six maps shows the head of Baffin's Bay as delineated by Baffin himself in 1616; and the second shows how Sir John Ross made the strange mistake of closing up all the straits, and turning them into shallow bays. Inglefield went to the entrance of Smith Sound, saw that there was a wide navigable sea to the northward, and sketched the map of which a copy is given. Kane and Hayes only took their small and unsuitable vessels to the entrance, where they wintered on the east coast; and the extent of coast explored by their travelling parties is uncertain, owing to the absence of reliable observations. Dr. Kane himself certainly never went north of the 79th parallel. His steward, Morton, and the Esquimaux, Hans, are supposed to have gone, on a dog sledge, as far north as about 80° 56′, to a point of land named Cape Constitution, on the east coast. Dr. Hayes went up the west coast with a dog sledge, and placed his furthest point in 81° 35′ N. But these positions are very doubtful, and it is certain that no vessel had ever been beyond just within the entrance of Smith Sound.

The largest map of the six shows the discoveries of Captain Hall, in the 'Polaris.' During the month of August 1871, he sailed up the long strait or channel through the entrance to which alone the name of Smith Sound is now given, across the Kane Basin, through Kennedy Channel, across Polaris Bay discovered by himself, and up a strait which he named after Mr. Robeson, the Secretary of the Navy, finally reaching a latitude of 82° 16′ N. on August 30. Here the little vessel was beset; but there was a water horizon to the north-east. The lofty eastern shore, at the furthest visible point, appeared to be trending to the north-east, while the western land continued to trend north for some distance farther. The 'Polaris' had attained this high latitude without a check or obstacle of any kind. The winter quarters were in a harbour called 'Thank God' Bay, in latitude 81° 38′ N. and longitude 61° 44′ W., which the 'Polaris' reached on September 3. A large inlet, 20 miles wide, and of an unascertained depth, which they called the 'Southern Fiord,' breaks the coast line on the western side of Polaris Bay. On October 10, Captain Hall started with an autumn travelling party, consisting of himself, Mr. Chester the first mate, and the Esquimaux Joe and Hans, but did not get beyond the 82nd parellel, to a point in Robeson's Strait which he called Newman Bay.[1] A bold promontory at the northern end of Polaris Bay was named Cape Lupton. On his return, Captain Hall was taken ill, he became partially paralysed and died on November 8. He was buried on shore, and a wooden monument was erected on his grave. He had the glory of dying in the midst of his discoveries.

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[1] Cape Brevoort, the northern point of Newman Bay, was in latitude 82° 2′ N. and longitude 61° 20′ W.

The climate of the winter quarters in 81° 38′ N. was found to be much milder than it is several degrees further south. In June, the plain surrounding 'Thank God' Bay was free from snow; a creeping herbage covered the ground, on which numerous herds of musk oxen found pasture; and rabbits and lemmings abounded. The wild flowers were brilliant, and large flock of birds came northward in the summer. Traces of Esquimaux were found—a proof that they have wandered far into the unknown area. A current of a knot an hour flows down Robeson Strait from the north, and carries the ice through Smith Sound, and out into Baffin's Bay. It was found that the tidal waves from the north and south met at Cape Fraser, on the west coast of Grinnel Land. To the south of Cape Fraser the flood tide makes to the north, whilst to the north it flows south. The rise and fall during spring tides was above five and a half feet, and during the neaps above two feet.[1]

On the death of Captain Hall, the command devolved upon the ice-master, Buddington, who seems to have resolved upon returning, without making further discoveries, in the spring, by means of sledge travelling. A party was sent in two boats as far as Newman Bay, but they abandoned the boats, and returned in July. On August 12, 1872, the 'Polaris' was again free, and her head was turned southwards. She appears to have been beset in 80° 2′ N., and drifted out into Baffin's Bay by the current; and on October 15 she was again beset, in latitude 77° 53′ N., off the north entrance of Whale Sound. The nip was so severe that boats and provisions were got on the ice, and the necessary preparations were made to abandon the ship. This, however, proved to be unnecessary, as the ice eased off, and the ship righted. But Tyson, the second master, Meyer, the meteorologist, the steward and cook, six seamen and eight Esquimaux, men, women, and children, remained on the floe with the boats and provisions. In any other country a boat's crew thus left in mid-ocean must almost certainly have perished; but in the Arctic regions there are special means of escape from danger, and the friendly ice drifted the boat's crew into safety, and supplied the means of building shelter from the storms and cold of an Arctic night. They obtained many birds, and killed more seals than they could consume. There is nothing wonderful in the drift of this boat on a floe in Baffin's Bay. James Ross, De Haven, M'Clintock, and the

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[1] See Captain Markham's Cruise, p. 201.

Resolute' drifted out exactly in the same way. Latterly, as the drifting floes began to break up, the means of obtaining food became precarious, and the party suffered much privation. On April 21, their larder was renewed by the Esquimaux, who shot a bear; and on the 29th the party was picked up by the sealing steamer 'Tigress,' commanded by Captain Bartlett, in 53° 35′ N., and only 40 miles from the land, near Wolf Island. They were taken into St. John's, Newfoundland, in good health. In this way early news was received of the remarkable success of Captain Hall's exploring voyage.

Meanwhile the 'Polaris' was driven to the north by a southerly gale, and run on shore at Lyttleton Island, near the entrance of Smith Sound. In these excellent quarters, with the remaining crew of fourteen men, she passed her second winter. They had plenty of provisions, and received much help from the friendly Esquimaux. In June 1873 the party built two boats, in which they went south until they were picked up by the 'Ravenscraig' whaler in Melville Bay. They were eventually landed at Dundee by the whaler 'Arctic' in perfect health and safety. Meanwhile the United States steamer 'Juniata,' commanded by Lieutenant Merriman, proceeded to Disco to obtain intelligence of the 'Polaris.' The 'Tigress' also was purchased, and sailed in July under the command of Captain

Greer, U. S. N., to convey succour to the 'Polaris' if it should be needed. The 'Tigress' is built for ice navigation, and went as far as Lyttleton Island, returning in the same season.

The news received from the crew of the 'Polaris' furnishes additional information of great importance. We now know that the American vessel commanded by Captain Hall passed up the strait, in one working season, for a direct distance of 250 miles, without a check of any kind, reaching latitude 82° 16′ N.; and that at her furthest point the sea was still navigable with a water sky to the northward. The 'Polaris' was a mere river steamer, of small power, and ill adapted for ice navigation, with a crew, all told, of thirty men, women, and children, including eight Esquimaux. If she could make such a voyage without difficulty, it may fairly be anticipated that a properly equipped English expedition, under equally favourable circumstances, would do more.

Another very important feature in the voyage of the 'Polaris' is the fact that she was safely drifted out into Baffin's Bay from a high northern position in the strait. This proves that the ascertained current keeps the ice in motion, and carries it south, thus preventing any long interruption of the navigation. The safety of a Government expedition is thus assured. For it is quite clear that the dangers of the Arctic regions are, in most instances, the direct consequences of despatching ill-equipped and inadequately supplied vessels with undisciplined crews. The really unavoidable dangers are thoroughly understood, and most of them can be obviated by modern appliances and experience. Two vessels stationed at suitable distances could keep up communications with each other, and with the whalers which annually frequent the 'North Water' of Baffin's Bay, while, under the most unforeseen and improbable contingency, a safe retreat would always be kept open.

There is a third feature in the voyage of the 'Polaris' which strengthens the argument in favour of exploration by Smith Sound. At the winter quarters, in 81° 38′ N., the climate was milder than it is further south, and animal life abounded, including musk oxen. This account corroborates that of Dr. Hayes, who was able to supply his men with plenty of fresh provisions in the less hospitable region near the entrance of Smith Sound. A Government expedition, with properly organised hunting parties, will be able to obtain considerable supplies of fresh meat, and thus add to the prospect of maintaining the men in health and vigour. Under such circumstances there is no healthier climate than that of the Arctic regions.

These considerations are sufficient to show that the highly important scientific results of Arctic exploration can be secured without undue risk, and with a reasonable assurance that no disaster involving loss of life or health is to be apprehended. The system of Arctic sledge travelling, which is now thoroughly understood, will ensure the examination of a vast extent of new country in various directions, from the wintering position of the two ships: and the navigable seasons will enable the expedition to obtain valuable information respecting the hydrography of the now unknown seas round the Pole. The story of Arctic exploration is a cheering and invigorating story. Each succeeding enterprise has added more and more to the stores of human knowledge; and, in the present day, when the true methods of exploring are well known, and men of science have clearly enumerated the important problems that will be solved, and the numerous valuable results that will be derived from the labours of an Arctic expedition, the reasons for despatching one have acquired tenfold force.

CHAPTER X.

THE PARRY ISLANDS.

The discoveries of Kane, Hayes, and Hall indicate the point where the known land reaches farthest north in the Polar space. Thence the threshold of the unknown region extends along the northern side of the Parry Islands to Behring's Strait, and has only been touched by officers in command of ships or travelling parties employed in searching for Sir John Franklin. Going west along the boundary, from the meridian of the west side of Smith Sound in 77° W. to near the entrance of Jones' Sound in 85° W., the coast line has been seen by whalers and discovery ships navigating the 'North Water' of Baffin's Bay. From 85° W. to 90° W. is the channel leading from Jones' Sound to the unknown sea north of the Parry Islands. Jones' Sound was discovered by Baffin in 1616; and has often been entered by whalers. In 1848, Captain Lee of the 'Prince of Wales' ran up Jones' Sound for fourteen hours, and sent a boat on shore; where a view was obtained of very high land to the westward, and deep water was found close to rocks on the south coast. Captain Lee then steered N.E. for some distance, and found open water, as far as he could see from the mast-head, extending about N.W. to W.S.W. The distance the 'Prince of Wales' ran up the Sound, from the entrance, was about 150 miles. On August 16, 1851, Lieutenant (now Admiral) Sherard Osborn took the 'Pioneer' into Jones' Sound. He found it to be narrowest at the entrance, and that it increased in width to the westward. The scenery is magnificent, especially on the south shore, where, some ten miles in the interior, a huge dome of pure white snow envelopes land 3,000 or 4,000 feet high, named the Treuter Mountains by Captain Austin, who was on board the 'Pioneer' with Osborn. From this dome, long winding glaciers pour down the valleys, and project through the ravines, into the deep blue waters of this magnificent strait. Unfortunately the progress of the steamer was stopped by floes stretching across the strait, and she was obliged to return. Captain Inglefield, in the 'Phœnix,' also went some distance up Jones' Sound in 1853.

From 85° to 90° W. is the portion of Jones' Sound not yet fully explored, and thence the discoveries of Sir Edward Belcher extend from 90° to

97° W., along what has been named Grinnell Land.

Sir Edward explored this coast in the spring of 1853, and on May 20 he was stopped by open water, streaked with sailing ice, at the western entrance of Jones' Sound. This was in about 90° W., and from a little to the westward of this point Sir Edward went across the floe to the southernmost island of a most extensive archipelago, 'leading,' he says, 'to the N.E., or possibly to the Pole.' He adds that the heavy, even solid, state of the surrounding floe, and, where nipped, the almost berg-like lumps which protruded, afford a fair inference that the sea is seldom seriously disturbed in these latitudes. But the pack ice to the northward was from 6 to 8 feet thick, and was acted upon by a strong tide. In the offing a widely-packed state of floe ice was to be seen, denoting that during the severe autumnal and wintry gales that sea had been in motion. Early in June, the flights of birds pointed to the existence of water-holes, and consequent movements of the floes, and Sherard Osborn accounts for this early disruption by the passage of a strong tidal wave in an east and west direction. Admirals Richards and Sherard Osborn continued the examination of the frozen shores of the unknown Polar ocean from 97° to 109° W., along the northern side of Bathurst Island, to the north point of Melville Island. These dreary shores are composed of limestone. Osborn believed that to the northward there existed much land, either in the shape of Islands, or an extensive continuous continent. A large flock of lemmings was seen making its way over the ice, in a northerly direction.

From the extreme northern point of Melville Island, Captain R. Vesey Hamilton penetrated a little distance into the unknown frozen ocean, and reached an island seven miles from the land on June 7, 1853, which has been named after himself. It was four miles long, and the northern extreme consisted of a series of small peaks. The water had a strong taste of some mineral acid. Eight or nine miles farther north, out in the unknown Polar Sea, another small island was discovered, and named Markham Island.

From Melville Island to the north-west side of Prince Patrick's Island, the threshold of the unknown region was traversed by Sir Leopold McClintock, and the examination of the western and southern sides of Prince Patrick's Island was completed by poor Mecham, one of the finest fellows who ever entered the ice. I cannot mention his name without a few words of affectionate regret for his loss. Never was officer more beloved by his messmates, and the men would do anything for him. Genial and warm hearted, he was the life and soul of the winter amusements, and, when the season for work arrived, it was Mecham who performed the most wonderful feat of Arctic travelling on record. An accurate and painstaking observer, full of resource, and endowed with indomitable resolution, he was at the same time most careful of the comforts of his men. He was indeed the *beau idéal* of an Arctic officer; and when the subject of Polar exploration is discussed, the first feeling of those who served in the search for Franklin will be one of regret that the great ability, the high resolve, the numerous qualities for command which were united in the character of Frederick Mecham are lost to us for ever. He was second only to one as an explorer, and in some points equal even to him. That one was his friend and messmate, Sir Leopold McClintock. These two officers explored the shores of Prince Patrick's Island.

At the north end of this remote and outlying boundary of the unknown region there was tremendous pressure from heavy pack ice. There were hummocks 35 feet high, and masses of blue sea ice had been driven far inland. Mecham found the west side of Prince Patrick's Island to be composed of such low patches of gravel that it was difficult to distinguish land from sea. In this far-away part of the frontier of the unknown area, land and frozen sea were mixed together in inextricable confusion. Nothing but heavy pack ice was to be seen to seaward, with enormous pieces forced upon the beach. Yet this dreary limit of the known world once enjoyed a milder climate, for Mecham found trees of considerable size buried in a ravine, with bark in a perfect state, and in a position which proved that they must have grown on the spot. One tree was 4 feet round and 30 long. The position was 400 feet above the sea. At the N.W. extreme of Banks' Island, a great number of fossil trees was also found, 300 feet above the sea. Dr. Hooker considered the wood to be that of white spruce (*Abies alba*).

The boundary of the unknown Polar Region now crosses Banks' Strait, and passes down the west side of Banks' Island, discovered by Sir Robert M'Clure in the 'Investigator,' almost to the coast of North America. Here the ice presses close against the cliffs, and is of stupendous proportions. It draws 40 and 50 feet of water, and rises in rolling hills upon the surface, some of them 100 feet from base to summit. The ice along the coast of North America, especially opposite the Mackenzie River, is of the same formidable character, and the mighty polar pack forms the boundary between the known and the unknown on this meridian. It is called by the Esquimaux 'the land of the white bear.'

Thus we have followed the boundary of the unknow region from Novaya Zemlya to Behring's Strait, the third opening into the polar ocean. The heaviest and most formidable pack in the arctic seas is that which presses against the land from the north end of

Prince Patrick's Island to Behring's Strait, and no vessel has yet succeeded in sailing far towards the Pole on the meridian of Behring's Strait. Captain Collinson, in the 'Enterprise,' went a little to the northward of 70° N. on the meridian of Cape Lisburne, and Captain Kellett, in the 'Herald,' discovered some high land a little farther to the eastward, in 72° N. The boundary from Behring's Strait to Novaya Zemlya, which completes the circle, has been examined by Russian explorers.

Admiral Sherard Osborn has pointed out that the tremendous ice to the west of Banks' and Prince Patrick's Islands is never seen in Barrow or Jones' Straits, except in small fragments, and nothing like it ever comes down into the Atlantic by way of Spitzbergen; and he therefore concludes that it is landbound on its northern edge, and that an archipelago must sweep up very near the North Pole, on the meridians between Prince Patrick's Island and Siberia. In a valuable paper read before the Royal Geographical Society,[1] Osborn thus explains his reasons for believing that land extends far to the north of any point yet reached in the Arctic archipelago known as the Parry Islands:—

'While employed in compiling from the journals of Captain Sir Robert M'Clure the discovery of a north-west passage in H.M.S. "Investigator," I was struck with his description of the extraordinary ice met with by him in the sea west of the archipelago under consideration, and which he traced from Behring's Strait up to the north-west of Banks' Land, round a great curve of more than 1,000 miles. I compared it subsequently with the reports of Lieutenants Mecham and M'Clintock, who visited in 1853 the west shore of Prince Patrick's Island; and again with the remarks of Captain (now Admiral) Collinson, who, like M'Clure, passed between this great ice and the American continent in his remarkable voyage in H.M.S. "Enterprise."

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[1] On April 28, 1873.

'All their descriptions agreed; and it was evident to me that no one who has travelled elsewhere in the Arctic Regions had ever met with similar oceanic ice; and it certainly was nothing like the ice-fields found about Spitzbergen or the east coast of Greenland.

'Its character I often discussed with the able navigator of Sir Robert M'Clure's ship, the late lamented Stephen Court, who was subsequently my navigating officer for two years in H.M.S. "Furious." From this statement I can safely describe this western ice as a vast floating glacier-like mass, surging to and fro in an inclosed area of the Arctic Sea, bounded on the south by the shores of North America, on the west by Kellett and Wrangell Land, on the east by the Arctic archipelago under consideration, and on the north—and there is the query. But if there was space for it to move north, there is no question but that the furious south storms which sweep over the North American continent would blow it far in that direction, and bring its masses down into the Atlantic by way of Spitzbergen, whereas, as a matter of fact, it never went more than a few miles off the American coast, leaving a narrow belt of water; and directly the gale ceased it surged back again, with its edge grounding in 100 feet of water. The same phenomenon occurred along its eastern edge, where this great ice-field impinged on the archipelago and Banks' Island. There, under the most favourable circumstances, the ice never moved off more than a mile or two, and in most places came home against the cliffs, leaving hardly the width of the 'Investigator' to go past the edge of it, aground sometimes in 12 or 15 fathoms water, showing a thickness of 70 or 80 feet. Mecham and McClintock found it on the west coast of Prince Patrick's Island, pressed up with tremendous energy on those low shores, and forming in places such a barrier, especially on the south-west extreme, as to oblige Mecham to take his sledges landward, to avoid the insurmountable barrier the broken floe edge had there formed.

'The ice, as described to me, consisted of vast continuous fields, whose thickness below water was more than 60 feet, whilst the surface resembled hills and dales of rounded outline, studded close together; the major portion of these hillocks 30 or 40 feet in height above water, and some of them as much as 100 feet, packed so close together from the effects of alternate snow, thaw, and frost, that there was hardly footing to be found amongst them. And in proof of the extraordinary age of these ice-fields, these hillocks were found to be pure fresh-water ice, indicating the long period that the snows had fallen on the surface of that frozen sea. This ice must not be confounded in any way with what is called "packed ice." It was far too heavy and massive to be broken up in that manner, and it was only along its edge that fragments were found broken off by contact with the cliffs or shore. These fragments, as far as is known, form great ice streams, which pour through Behring's Strait and Barrow Strait, though much broken up and reduced in thickness long before they have been met with by our navigators. We saw very little of this ice in Jones' Sound, the entrance being there barred by Prince Patrick's Island and the lands which lie north of it.

'Apart from the ponderous character of this "mer de glace" leading me to the conclusion that it is formed in a land-locked sea, there are additional data, namely, the direction and the amount of tide on its shores. For of course, as in the Mediterranean and Black Seas, an enclosed area of salt water, with only a narrow outlet to a great ocean, has generally but slight rise and fall of tide.

'We find at Kotzebue Sound and Point Barrow, in Behring's Strait, where Moore and Maguire wintered in H.M.S. "Plover," that the flood tide came from the Pacific, and the rise and fall was only 2 feet at the former, and only 7 inches at Point Barrow.

'M'Clure, in the Princess of Wales' Strait, found that the flood tide came from the south, with only 3 feet rise and fall on spring-tides.

'At the Bay of Mercy, Banks' Island, the flood, such as it was, came from the east up Barrow Strait, with only 2 feet rise, agreeing much with all other observations taken up Barrow Strait, namely, at Beechey Island, Cornwallis Island, Leopold Island, and Melville Island, at which places the flood evidently came from the Atlantic, *viâ* Baffin's Bay, diminishing as it reached the sea west of the archipelago.

'In Jones' Strait the flood-tide likewise came from the east. Admiral Richards and I had good proof of this in a boat expedition during the autumn of 1852; and we both found, as we went westward along the north shore of the Georgian or Parry group, that the tides, as indicated by the ice-action upon the shore, diminished likewise as we went west.

'Now, if the area of sea west of this archipelago was not land-locked, but opened into the general space called the Arctic Ocean, I think seamen and geographers will agree with me that the tidal wave of that vast area, as compared with the limited one of Baffin's Strait, would cause the flood-tide to come from it into, at any rate, the west entrance of Barrow Strait and Jones' Sound, whereas the evidence I adduce shows that the flood travels towards this sea, which I say is enclosed by land, instead of from it, as would otherwise be the case. The best parallel I can give to the tidal observation of Barrow's Strait, is that of the Straits of Gibraltar and the Cattegat, where the flood-tide flows into two enclosed seas from the Atlantic Ocean.

'Apart from the tideless character of the sea west of the archipelago leading me to the belief that it is land-locked to the north, and has no communication with that portion of the Polar waters which flows into the Atlantic, there is another corroborative fact. The two great Polar currents by which that enormous amount of ice discharges itself into more southern latitudes come from two opposite directions. The ice formed north of Spitzbergen and Nova Zembla discharges itself by a south-westerly current, of which there is ample evidence, and the rate, according to the season, varies from eight to thirteen miles a day. On the other hand, the ice from what I believe to be an enclosed sea west of the archipelago discharges itself for the major part in a south-easterly direction, of which we have had practical proof since 1850 in the drifting out to sea in Davis' Straits of the four expeditions when beset, of James Ross, De Haven, Kellett, and M'Clintock; the only exception to this south-easterly current being a small amount of much disintegrated ice, which escapes southward into the Pacific through the shallow Strait of Behring. The only way I can account for two diametrically opposite currents flowing from that Polar area before us is by assuming they flow from two spaces of water separated from each other.

'I have, therefore, not the slightest doubt that, whether this Arctic archipelago be followed to the north, or the recently discovered lands north of Siberia near Behring Strait be traced, we shall find that they are nearly connected one with the other; and, in doing so, the exploration of the Polar area will be thoroughly and successfully accomplished.

'Let me now point out in what way these lands, if they exist, give good promise for future exploration.

'In the first place this archipelago abounds in harbours and creeks where a ship can find shelter, having pushed during the summer season as far as navigation can carry her. She then secures a base safe from the ever-southerly drift of winter ice. From such a position in early spring, sledge parties on the system introduced by my distinguished friend Sir Leopold McClintock can be pushed forward to the utmost limits of men's physical powers. Secure in a harbour, those on board the ship can pursue the scientific researches which have hitherto been so much lost sight of in Arctic exploration, and also avoid the horrors of wintering in the pack, which have been testified to so vividly, even in our time, by Sir George Back, Captain De Haven, and Sir Leopold McClintock, not to speak of the still more disastrous experiences of our German brethren in the *Hansa*.'

CHAPTER XI.

RUSSIAN ARCTIC DISCOVERY.

THE discovery of the shores of the Polar ocean, from Behring Strait to Novaya Zemlya (145 degrees of longitude) is due to the Russians. Those shores are, perhaps, the most desolate on the whole circle of the threshold to the Unknown Region. The Siberian rivers—the Obi, the Yenisei, the Lena, the Indigirka, and Kolyma—rise in the Altai mountains, and flow, in their upper courses, through forests of tall trees. But, before they reach the Polar ocean, they traverse a dreary region of frozen swamp, which is barely habitable, called the *tundra*. Here the land is frozen for many feet below the surface. The rivers, during times of flood, bring down vast quantities of uprooted trees, which line their banks in immense masses, and are eventually carried into the Polar sea, to be drifted away with the current which flows from east to west along the Siberian coast.

The efforts of the Russians to double the extreme northern points of Siberia—Capes Taimyr

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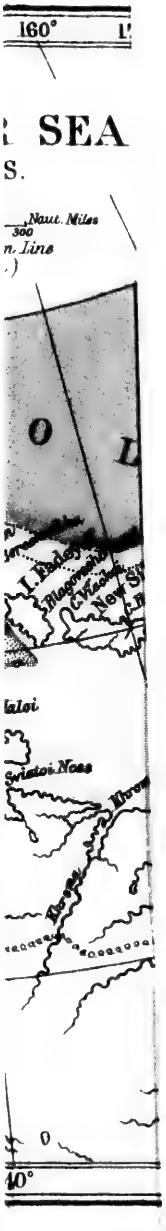

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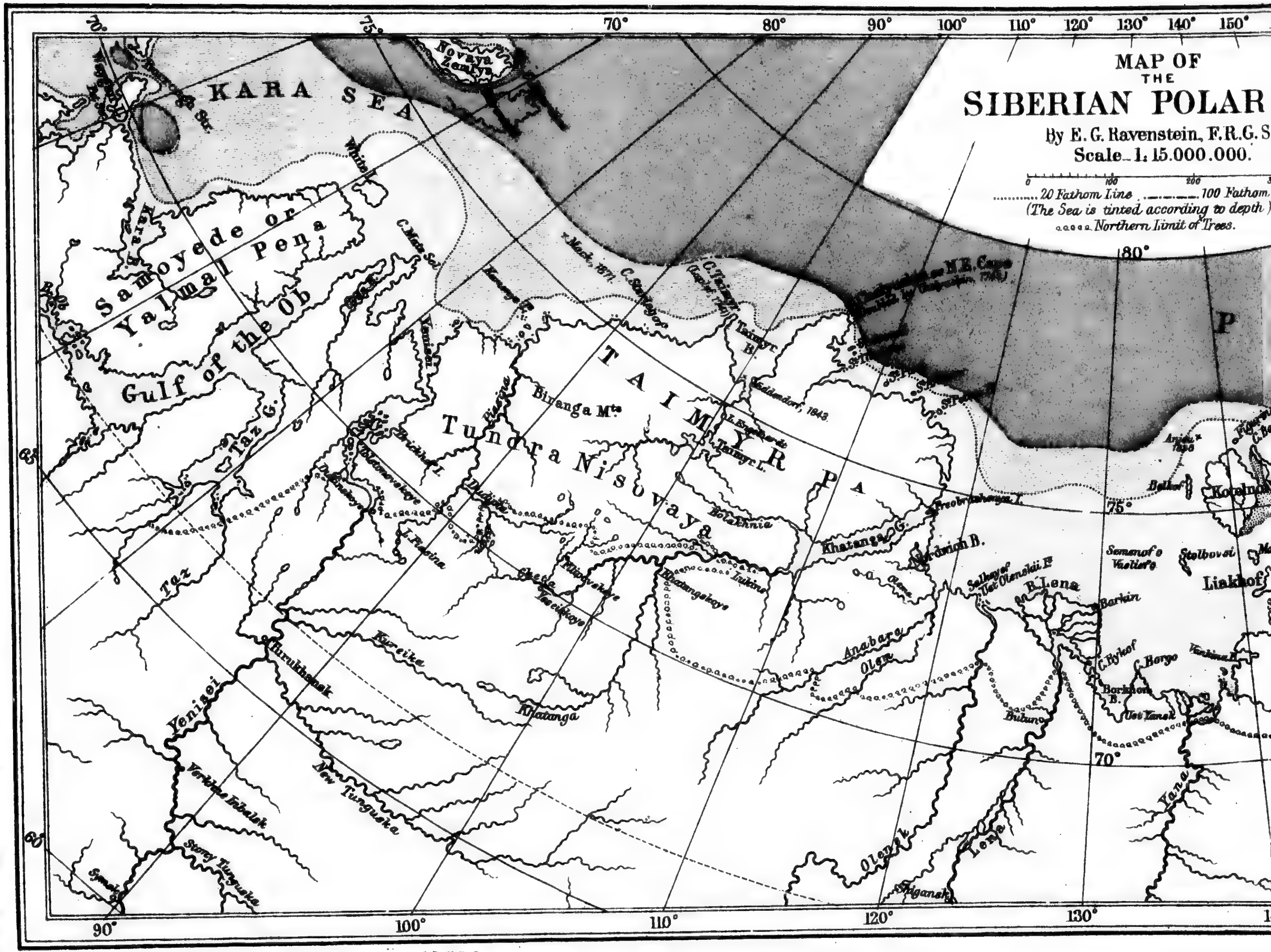
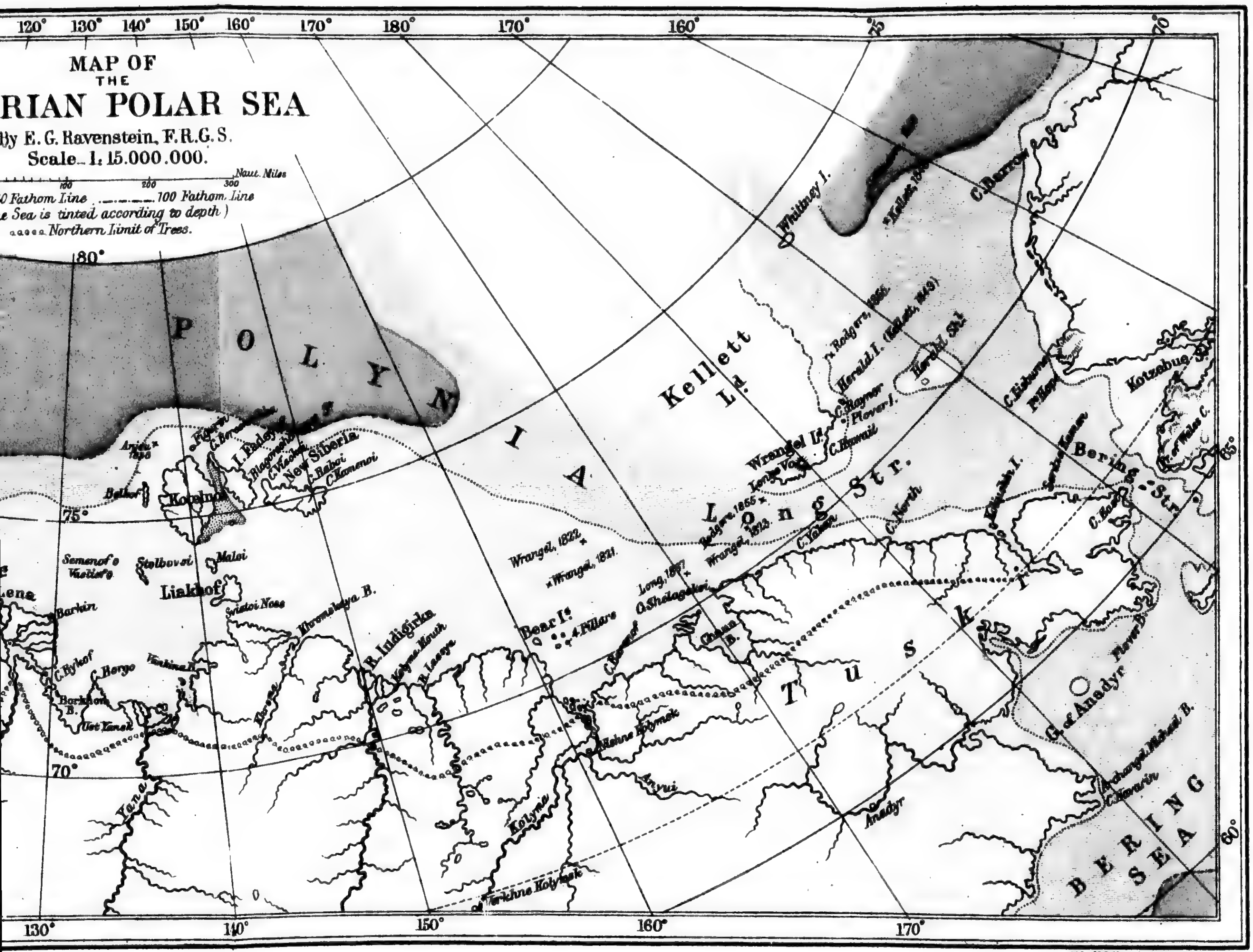


For "The Threshold of the unknown Region" by C.R. Markham, C.B. F.R.S.

London, Sampson Low, Marston, Low, & Searle,


MAP OF
THE
RIAN POLAR SEA
By E. G. Ravenstein, F.R.G.S.
Scale 1: 15.000.000.

Edwd. Weller, Litho Red Lion Square

on Low, Marston, Low, & Searle, 188 Fleet Street

and Chelyuskin, the latter in 77° 30′ N.,—have hitherto been unsuccessful. Burrough, Pett and Jackman,[1] the early English explorers, discovered the straits between Novaya Zemlya and the main, thus entering the sea of Kara. The Russians, in very early times, constantly went from Archangel to the mouth of the Obi, creeping along between the land and ice in the sea of Kara, and usually hauling their boats, or *lodias*, across the isthmus between Kara Bay and the gulf of the Obi. In the last century several expeditions were sent by the Russian Government in the same direction, and vessels reached the mouth of the Pyasina, on the west side of the northern point of Siberia, and the Khatanga on the east side. But no navigator has ever doubled that most northern cape of the Asiatic continent.

In 1734, Lieutenant Muravief sailed from Archangel towards the river Obi, but was stopped by the ice in the sea of Kara. In 1738, however, Lieutenants Malgyn and Shurakoff doubled the promontory with great difficulty and reached the mouth of the Obi. The next step was to sail from the Obi to the Yenisei. This was effected in the same year by Lieutenant Koskelef. In the same memorable year for Siberian exploration, the pilot Menin sailed from the Yenisei towards the Lena, but was stopped by the ice at the mouth of the Pyasina, and returned unsuccessful. Three years before, in 1735, Lieutenant Pronchishchef made a similar attempt from the eastern side. He sailed down the Lena from Yakutsk, accompanied by his wife, but was hampered by ice, which only left a passage of 200 yards along the coast, and was at last obliged to winter at the mouth of the Olenek. The following year he reached the mouth of the Khatanga, and pushed beyond it, but found himself at last closely beset near Cape Chelyuskin, his extreme northern point being 77° 25′ N. He and his wife died at the winter quarters, near the mouth of the Olenek, and the command devolved upon Lieutenant Chelyuskin who returned. In May 1740, Lieutenant Laptef found fixed and impenetrable ice in the same place, and returned convinced of the impossibility of sailing round Cape Taimyr. But, in 1742, Chelyuskin reached the northernmost point of the continent in sledges, in latitude 77° 34′ N., doubled it, and returned to the mouth of the Taimyr. This cape is now known as Cape Chelyuskin.

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[1] See pages 5 and 7.

In 1843, Middendorf was sent to explore the region which terminates in Cape Taimyr, by land. He descended the river Khantanga, and reached the Taimyr lake in June. In August he arrived at the shores of the Polar sea, and sighted Cape Taimyr, whence he saw open water, and no ice-blink in any direction. He found the rise and fall of the tide to be as much as 36 feet. His visit was, however, in the very height of the short Arctic summer.

From the mouth of the Lena eastward, vessels have frequently reached the river Kolyma, but the doubling of the capes still farther east has been attended with great difficulty. Nijni Kolymsk, near the mouth of the Kolyma, was founded, in 1644, by a Cossack named Michael Staduchin; and, in 1648, another Cossack, named Simon Deshnef, equipped an expedition there, consisting of three little crafts called *kotchys*, which were broad, flat-bottomed, decked vessels, about 70 feet long, with sails and oars. He rounded Cape Chelagskoi, passed through the strait, afterwards named after the explorer Behring, and reached the gulf of Anadyr. Most of his men died of hunger; but Deshnef himself succeeded in establishing a walrus fishery in the Anadyr.

Peter the Great desired that the whole northern coast of Siberia should be explored by sea, and he died a few days after giving his instructions to Captain Vitus Behring with his own hand, in 1725. Behring was a Dane, in the Russian service. He was despatched from St. Petersburg to the furthest point of Siberia with sailors and shipwrights, and two vessels were built at Okhotsk and in Kamschatka, the 'Gabriel' and the 'Fortuna.' In July 1728, he sailed from the river of Kamschatka, and examined the coast for some distance to the northward, ascertaining the existence of a strait between Asia and America. In September 1740, Behring sailed again from Okhotsk, in a vessel called the 'St. Paul,' with another in company, commanded by Lieutenant Chirikof, called the 'St. Peter.' George Wilhelm Steller embarked with Commodore Behring as naturalist of the voyage; and in June 1741, they sailed to discover the American coast. That magnificent peak, named by Behring Mount St. Elias, was discovered, and the Aleutian Islands were explored, but scurvy broke out amongst the crews, and the commodore himself was attacked by it. In November the ship was wrecked on an island which was named after the ill-fated discoverer himself, who was carried on shore, and placed in a sort of pit or cavern dug in the side of a sand-hill. Here he was almost buried while alive, for the sand kept continually rolling down, and he requested that it might not be removed as it kept him warm. In this miserable condition poor Behring died on December 8, 1741. Steller was naturally anxious to procure supplies of animal food for his scurvy-stricken patients, and he carefully examined into the natural history of the island. He attributed the cure of those who recovered, to the flesh of the sea-otter; and 900 of their skins were collected on the island, which the Chinese, at Kiakhta on the Russian frontier, will buy at the rate of eighty to a hundred roubles (about 30*l.*) a piece. Thirty of the crew died on the island, and the forty-five survivors escaped to Kamschatka in a little vessel built from the wreck of the 'St. Paul.' The most remarkable and interesting event of this voyage was the discovery by Steller of a rare and solitary species of manatee or sea-cow, called *Rytina Stelleres.* It has since been hunted and probably exterminated, for no specimen has been seen for more than seventy years. This creature had a sort of bark an inch thick, composed of fibres or tubes perpendicular on the skin, and so hard that steel could penetrate it with difficulty. It lived on sea-weed.

After Behring Strait, the most important discovery of the Russians during the last century was that of the Islands of Liakhof or New Siberia in the Polar ocean, opposite the coast between the mouths of the Lena and Indigirka. In March 1770, a merchant named Liakhof saw a large herd of reindeer coming over the ice from the north, which induced him to start with sledges early in April, to trace the tracks they had left. After a journey of fifty miles over the ice he discovered three large islands, and the following year he obtained the exclusive right from the Empress Catherine to dig for mammoth bones on them. The largest of these islands is called Kotelnoi, and is 100 miles long by 60 broad, in 76° N. latitude. The next is called Fadeyef, and there is another, called New Siberia, more to the eastward. The length of the whole group is 205 miles. Immense alluvial deposits, filled with wood and the fossil bones of animals, are found throughout the shores of Arctic Siberia ; but in the cliffs or 'wood hills' of the New Siberia Islands these deposits are still more plentiful. For years after their first discovery the seekers for fossil ivory annually resorted to these islands; and, in 1821, the fossil ivory thus procured weighed 20,000 lbs. Hedenström, a Russian officer, residing at Yakutsk, was employed by the Government to survey the New Siberian Islands in 1809, and occupied three years in their exploration. He reported, in 1810, that, to the northward of these islands during three years, he was always stopped, at a short distance from the land, by weak ice.

In March 1821, Lieutenant Anjou[1] went across the ice with dog sledges, to the Kotelnoi Island. He then travelled over the ice to the northward in April, and saw vapour rising to the N.W. when at a distance of 42 miles from Kotelnoi (latitude 76° 38′), which led him to suppose that there was open water in that direction. But Wrangell tells us that when the ice cracks, even in places where it is thick and solid, vaporisation immediately ensues, which is more or less dense according to the temperature of the atmosphere. In the same month, Anjou made another journey to the northward, but was stopped by thin unsafe ice. On the 18th, the party saw open sea with drift-ice to the northward, from Cape Visokoi in New Siberia, and dense vapour. Off Cape Räboi the ice appeared unbroken, but was rugged with lofty hummocks. Hedenström had met with hummocks 90 feet high. In May, the expedition of Anjou returned to the mainland, and wintered at Ust-Yansk. In March 1821, Anjou again saw vapours rising to the northward, when he crossed to Liakhof Island. Open sea, with drifting masses of ice, was seen on the 26th, the ice drifting from east to west. The frequenters of the islands believe this current to be the ebb tide. On April 9, he started over the ice to the eastward of New Siberia, and met with thin ice on the 14th, at a distance of 60 miles, but lines of impassable hummocks obliged him to make for the mainland. Lieutenant Anjou arrived at the conviction that all efforts to advance by the ice to any considerable distance from land would prove unvailing, owing to the thinness of the ice, and to the open water within 20 to 30 miles of the islands. His expedition, however, effected a complete survey of this interesting group. There is very little driftwood on the north side of these islands, but on the south side it is found in two bays in great abundance. The sea between the islands and Siberia is not completely frozen over until the end of October, and the coasts are free by the end of July. Throughout the summer the sea is covered with floes of ice, drifting to and fro with winds and currents.

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[1] Afterwards Admiral Anjou.

While Anjou was conducting these explorations, Wrangell was prosecuting similar researches from his head-quarters at Nijni Kolymsk, near the mouth of the Kolyma, whence he made four journeys on the Polar sea, in 1820, 21, 22, and 23. These journeys were performed in dog sledges, called *narti.* The runner of a Siberian *narti* of the best construction is 5 feet 10 inches long, breadth of the sledge 1 foot 9 inches, and height of runner 10 and a quarter inches. The runners are of birchwood, and the upper surface of the sledge of willow shoots woven together. All the parts are fastened together with hide thongs. When in use the sledges are turned over, and water is poured on the runners, to produce a thin crust of ice, which glides easily over the snow, and the ice runner is called *wodiat.* As spring advances, it of course becomes useless, and whalebone is sometimes substituted. Wrangell considered March to be the best time of the year for sledging, when it is easier work for the dogs. A well-loaded sledge requires a team of twelve dogs, and they will drag 1,260 pounds in spring, but in the intense cold of winter, 360 pounds is a heavy load. They were fed on frozen fresh herrings. The provision for five men for a month was 100 pounds of rye biscuit, 60 pounds of meat, 10 pounds of portable soup, 2 pounds of tea, 8 pounds of grits, 3 pounds of salt, 39 rations of spirits, 12 pounds of tobacco, and 200 smoked fish (Iuchala), each equal to five herrings. The men wore reindeer-skin shirts, great leathern boots lined with fur, a fur cap, and reindeer-skin gloves. The party had a conical tent of reindeer-skin, 12 feet across on the ground, and 10 feet high, with a light framework of six poles; and, when they encamped, they lighted a fire in the centre of it, and were half smothered. Each man slept on a bear-skin, and a reinder-skin coverlet was provided for every two.

In his first journey, during March 1820, Wrangell explored the coast from the mouth of the Kolyma to Cape Chelagskoi. The temperature was occasionally as low as — 31° Fahr. His second journey was undertaken in order to see how far he could go over the ice to the northward away from the Siberian coast, and he started on March 27, 1821. At a distance of two miles from the shore, the party had to cross a chain of high and rugged hummocks five miles wide, beyond which there was an extensive plain of ice. Wrangell continued to advance to the northward for a distance of 140 miles, when he found the ice to be very thin and rotten, owing to large patches of brine that were lodged on the snow. There were cracks in every direction, through which the sea-water came up, and the ice was scarcely a foot thick. It was, therefore, deemed prudent to commence a retreat on April 4. In approaching the coast again, they had to cross ranges of hummocks of greenish-blue coloured ice, often 80 and 90 feet in height, denoting tremendous pressure during the winter. Wrangell returned to Nijni Kolymsk on April 28, after an absence of thirty-six days, during which time he had travelled over 800 miles. He was much struck during this journey at the wonderful skill displayed by the sledge-drivers in finding their way by watching the wave-like stripes of snow, which are formed by the wind. 'These wave-like stripes of snow, formed on the level ice of the sea by any wind of long continuance, are called *sastrugi* in Siberia. The ridges always indicate the quarter from which the prevailing winds blow. The inhabitants of the *tundras* often travel over seven hundred miles with no other guide than these *sastrugi*. They know by experience at what angle they must cross the greater and lesser waves of snow, in order to arrive at their destination, and they never fail. It often happens that the true permanent *sastrugi* have been obliterated by others produced by temporary winds, but the traveller is not deceived thereby, his practised eye detects the change, he carefully removes the recently drifted snow, and corrects his course by the lower *sastrugi*, and by the angle formed by the two.' On his third journey Wrangell started northward from the coast on March 16, 1822, chiefly with the object of ascertaining the truth of a native report that there was high land in that direction. On April 12, after having travelled for many days over very difficult hummocks, the party came to such weak ice, broken up by so many cracks, that he supposed that the open sea must be at hand, and deemed it prudent to return, when 170 miles from the land. The north winds were observed to be invariably very damp winds, which was also supposed to indicate the existence of open water in that direction. On this occasion Wrangell was absent fifty-five days, and went over 900 miles. He reached Nijni Kolmysk on May 5. The fourth and last journey was commenced on March 14, 1823, and Cape Chelagskoi was reached on the 8th. A Tchuktchi or Tuski chief here informed Wrangell that, from an adjacent part of the coast, on a clear summer's day, snow-covered mountains might be descried at a great distance to the north, and that herds of reindeer sometimes came across the ice of the sea, probably from thence. The natives concur in stating that Cape Jakan is the nearest point to this northern land. The party struck off across the ice to the northward when they had gone a little beyond Cape Chelagskoi ; but a violent gale of wind cracked and broke up the ice, which was only three feet thick, placing them in considerable danger. As they advanced it became thinner, and they only succeeded in crossing the cracks, just frozen over, in safety, owing to the incredibly swift running of the dogs. Wrangell was obliged to turn back a distance of 70 miles from the land, and in reaching it they had to ferry themselves across many cracks, on pieces of ice, the dogs swimming and towing. The temperature of the sea was —28° Fahr. This was in the end of March. To the west the sea appears completely open, with floating ice, and dark vapours ascending from it obscured the horizon. Lanes of water were opening in all directions, and, without a boat, the little party was placed in a position of extreme danger. A gale of wind dashed the pieces of ice against each other with a loud, crashing noise, and split many of the floes into fragments. The dogs saved them. They dashed wildly and swiftly towards the land, and reached it on the 27th. Wrangell continued the coast survey for some time longer, and returned to Nijni Kolymsk, on May 10, after an absence of 78 days, having travelled over 1,530 miles. Thus ended the series of attempts to reach the unknown land, which, though not seen by him, Wrangell still thinks may possibly exist. On Wrangell's map it is stated that the mountains are visible from Cape Jakan, in clear summer weather.

This land was sighted by Captain Kellett, who, in 1849, penetrated, in H.M.S. 'Herald,' as far as 71° 12′ N., discovering Herald Island, and seeing the distant line of coast. Afterwards the Americans established a whale fishery beyond Behring Strait, and one of them, Captain Long, went some distance along the Siberian coast, and sighted the northern land in 1867. It is now marked on the maps as Kellett Land.

The observations of Hedenström, Anjou and Wrangell, have led Russian geographers to the conclusion that there is a part of the Polar ocean always an open sea, extending from some twenty miles north of the New Siberia Islands, to about the same distance off the coast of the continent between Cape Chelagskoi and Cape North. This opinion rests on the instances in which explorers, in March and April, have encountered either open water covered with loose floes, or very thin ice, indicative of its immediate vicinity, at different points of this line. Admiral von Wrangell considered that the fact of the northerly winds being sufficiently damp to wet the clothes of his party, was a further corroboration of the existence of an open sea in that direction. In summer, the current along the Siberian coast is from east to west, and in autumn from west to east. The great Siberian rivers bring down immense quantities of drift-wood, which is afterwards carried off by the currents, and spread far and wide over the Arctic shores. On the breaking up of the ice their waters contribute to drive the floes from the coast. The westerly current then carries them in heavily-packed masses towards the Atlantic, and millions of tons of ice are thus sent to swell the size of the polar pack, and are annually melted between Greenland and Novaya Zemlya.

Admiral von Wrangell, using an allowable poetical licence, has called the open water off the Siberian coast 'the wide immeasurable ocean,' and ever since the 'great Polynia[1] of the Russians' has been a phrase on which geographical theorists have founded the wildest speculations. Now, in all parts of the Arctic Regions the ice is more or less in motion during the summer, so that the observation of open water by Middendorf, near Cape Taimyr, in August, is nothing remarkable. Anjou and Wrangell, during the months of March and April, found the ice to be thin and rotten at a distance of about 100 miles from the coast, and on one or two occasions an open sea covered with floating pieces of ice was seen in the offing. Vapours rising at a distance, and damp north winds, were looked upon as additional proofs of the existence of this great *Polynia.*

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[1] Polynia simply means a pool or lane of water in the ice. The term is applied to such pools, when the ice is breaking up in the Neva. *Polyi* is an obsolete Russian word meaning open; *Nya*, the feminine termination, giving the word a substantive form. *Polyi-dveri*, 'Open doors.'

There can be no reason to doubt that, owing to strong currents and gales of winds, the ice is in motion off the coast of Siberia very early in the spring, giving rise to *Polynias*, or lanes and pools of water; but there is nothing in the observations of the Russian explorers to warrant the belief in a 'wide immeasurable ocean.' The rising vapour, so often mentioned by Anjou, is caused by tidal cracks in the ice, and is no proof of an open sea; and the phenomena of damp winds and rotten ice betoken just what Anjou saw—a limited expanse of sea, covered with drifting floes. There is no evidence whatever that the Siberian *Polynia* of the early spring is of greater extent than the prevalence of gales of wind and currents would easily explain. The weak ice, where the Russians were stopped, was in a very shallow sea, and they never mention a greater depth than 14 fathoms. Hence the winds have a great effect in producing currents. In this depth they mention the ice being packed up until it grounded; and, thus obstructed, the crushing up of the drifting ice was prodigious.

It should be borne in mind that the exceptional condition of the Siberian polar sea never offered any obstruction to the examination of the coast, and that weak ice was first met with at a distance of several miles from the shore.

The latest Russian exploring achievement in Siberia has been the examination of the mouth of the Yenisei, by Herr Schmidt.

In 1866, in consequence of the alleged discovery of a mammoth skeleton in the vicinity of the lower Yenisei river, Herr F. Schmidt was despatched by the Imperial Academy of Sciences at St. Petersburg to conduct a reconnoitring expedition in the districts between the Obi and the Yenisei, and to amplify the work of Von Middendorf in those parts. The account of the expedition was published in the 'Memoirs of the Imperial Academy of Sciences' at St. Petersburg.

An interesting fact in connection with the river Yenisei, is the immense quantity of drift-wood lying on either side of its banks. About the low lands of the estuary the wood lies scattered about, and, mixed with loam and sand, forms the chief component of the numerous islands studded about the mouth. In many places peat-moss is to be found, and stems of trees, which prove that vegetation formerly spread farther north than now. Here, as well as in most parts of Siberia, the larch (*Larix Sibirica*) marks the commencement of forest growth. Looking from Dudino, all to the south of the Dudinka is forest, while to the north dead stumps of trees are to be seen in hollows. Westward there is proof that vegetation formerly extended farther north. The line of demarcation of the larch runs from Pässino lake in the Noril mountain range, about 67° 50′ N. latitude (to the east of the Yenisei), along the Dudinka river to Dudino, and thence along the right bank of the Yenisei to Sseläkino; here it crosses the Yenisei, and from the mouth of the Keta runs in a south-westerly direction past the upper Solenaya to the lower Tas. Northward of the larch, two trees are met with, the *Betula contorta* and *Abies obovata*, and on and about the river Yenisei the *Alnaster fructicosa*, a species of alder, which grows up to one's shoulder as far as 70° 50′ N. latitude, and about 71° creeps along the ground.

The population consists wholly of Russian peasants, who are divided into two congregations or parishes, the two churches being in Turuchank and Dudino. From Tolstoi to Turuchank occur small settlements of one or two houses, whose sole duties consist in looking after the postal communications. From Tolstoi to beyond the mouth of the Pasina, settlements or groups of houses (though long since abandoned through the severity of the climate or difficulty of communication) have been laid down on maps, being copied from older maps without sufficient warrant. From the middle of June to the end of

August, Samoyedes and Russians erect tents, dome-shaped huts made of drift-wood and loam, and regular cottages with windows and ovens, and a brisk preparation of salt-fish goes on in them and on board the river craft. The Tundra is inhabited by the Ufer-Juraks, in addition to the Russian population. These penetrate into the peninsula between the Obi and the Yenisei from April till October, and during the winter months they retire into the Beresow circle of the Tobolsk Province.

The labours of such men as Hedenström, Anjou, Wrangell, Lütke, Baer, Erman, Middendorf, and Schmidt, entitle Russia to take rank next to England as a nation that has won glory in the noble field of Arctic exploration. The bleak *tundras* and forbidding shores of Northern Siberia offer great obstacles to such work, and these obstacles have been overcome with an amount of energetic perseverance and determination which places the Russian explorers high on the glorious roll of Arctic worthies. It is to their exertions that we owe the examination and careful survey of more than a third of the threshold of the unknown Polar Region, the whole of which has been accurately surveyed and scientifically described. The gallantry with which Wrangell and Anjou again and again forced their way northward over weak and rotten ice, thereby exposing themselves to danger and risk of no ordinary character, in the cause of science, and in their zeal for geographical discovery, excites our warmest admiration; while to the charming work of the Baron von Wrangell we are indebted for much of the knowledge we possess of a considerable section of the threshold of the unknown region.

CHAPTER XII.

THE NORWEGIANS OFF NOVAYA ZEMLYA.

CAPTAIN WIGGANS.

The whole circuit of the threshold of the unknown region has now been made; and we return to Novaya Zemlya, the point which Barents reached nearly three hundred years ago, and where Carlsen, in 1871, discovered the relics of the great Dutch navigator. It only remains to notice the voyages of other Norwegian fishers, and of Captain Wiggans, off the coast of Novaya Zemlya, and in the sea of Kara, and to record the proceedings of the Austro-Hungarian Arctic Expedition.

In 1869 Carlsen had passed through the Pet[1] Strait, and sailed along the coast of Siberia to the mouth of the Obi; Palliser sailed northwards, and returned by the Matochkin Strait, and Johannesen twice sailed through the sea of Kara without check from ice. In 1870 about sixty Norwegian sailing vessels went to the seas round Novaya Zemlya, and Captain Johannesen circumnavigated those islands. In 1871, as has already been recorded, Carlsen and Mack were in company. Mack left Tromsö on May 22, 1871, and encountered thick impenetrable ice in 71° 12′ N. lat., and 45° E. long. In 71° 50′ N. the sea was clear of ice, and after sailing into the sea of Kara, Captain Mack turned northwards and coasted along 500 miles of the Novaya Zemlya coast. He found a mild temperature off the islands that have been named the 'Gulf Stream Islands.' It is on this spot that Barents, in 1598, is supposed to have found a sandbank in 18 fathoms. There are now, on what is thought to be the same site, some barren and sandy islands, and it has been suggested that there has been an upheaval of land to a height of upwards of 100 feet in 300 years. Pods of a West Indian bean were found near these islands—an indication that the warm Atlantic current which flows past the coast of Norway reaches as far as these islets off the Novaya Zemlya coast, which have hence been called the 'Gulf Stream Islands.' Captain Mack reached a point in latitude 75° 25′ N. and longitude 82° 30′ in the beginning of September, when no ice was in sight, and the temperature was remarkably mild. This was his farthest point before returning to Norway. In the same year, as has already been recorded,[1] Captain Carlsen circumnavigated Novaya Zemlya.

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[1] Improperly called Jugar Strait. It was discovered by Arthur Pet in 1580. See p. 7.

In June 1871, Captain E. H. Johannesen found the Matochkin Strait, and those of Burrough[2] and Pet, blocked with ice; so he sailed northwards, and on October 15 was in 76° 25′ N., the sea being clear of ice. In the same year Captain Isaksen left Tromsö on June 6, and after passing through much pack ice on the Novaya Zemlya coast, reached as far as the Hooft promontory. Captain S. Johannesen sailed through Burrough Straits on August 26, and coasted along the Samoyeden Peninsula in a sea clear of ice, returning through the straits on September 27. Captains Dorma and Simonsen made similar voyages in the same year.

These Norwegian voyages fully corroborate the observations of Barents, and show that, during the summer months, the seas round the western and southern shores of Novaya Zemlya may generally be navigated, and that the open water seen by Wrangell and Anjou to the north of Siberia may probably be reached. In July 1870, the steamer 'Albert,' belonging to a shipowner named Rosenthal, with Dr. Bessels on board, left Tromsö, went to Spitzbergen, and afterwards reached the Matochkin Strait on August 7, but the channel was filled with ice. The vessel was then steered south, in hopes of finding the Straits of Burrough or Pet clear, but they remained blocked until September 9, when Herr Rosenthal's steamer returned. Six weeks later in the year Captain Johannesen sailed through them.

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[1] See p. 20.

[2] Improperly called Kara Strait. It was discovered by Stephen Burrough in 1556. See p. 5.

In 1872–73 Captain Sivert Tobiesen was unfortunately obliged to pass the winter on the Novaya Zemlya coast, in his schooner 'Freya,' not far from the Birch Islands. Most of the crew were sent overland, and arrived in good health at Archangel. The captain, his son, and two men, finding the ship making water, were forced to land; and Captain Tobiesen died of scurvy on April 29, 1873. His son died of the same disease on July 5. They had lived on seal blubber and bear meat, and during the latter part of the time had only a little badly salted and half rotten bear-flesh. The two survivors put off in a boat in August, and were picked up by a Russian vessel, and brought into Archangel. Captain Tobiesen was a distinguished Norwegian Arctic explorer, and his loss is much to be deplored. He wintered on Cherry Island in 1865–66. He made a remarkable voyage round North-east Land in 1864,[1] and he reached almost the same latitude east of Spitzbergen as was attained by Payer in 1871. He was one of the boldest among the gallant band of Norwegian explorers.

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[1] See p. 89.

But long before the Norwegian voyages were recorded, it was known that the sea of Kara, which Burrough and Pet had found so formidable, was navigable at certain seasons; and a more complete knowledge of these seasons would, there can be little doubt, lead to the establishment of a trade between Europe and the mouths of the Siberian rivers. It is now more than ten years ago since a proposal, with this object in view, was made to Sir Roderick Murchison, by M. Sideroff, a Russian gentleman, who owned large mines of graphite near Irkout on the Yenisei river. He offered a premium of 2,000*l.* for any ship that could reach the mouth of the Yenisei, and a guarantee of 20*l.* a ton for as much freight as the ship could carry. Captain Allen Young, the companion of McClintock in the 'Fox,' undertook the venture; but it was subsequently intimated that the Russian Government was unfavourable to the scheme.

A voyage, with a similar object, has, however, been made by Captain Wiggans, recently an examiner in seamanship at Sunderland, and an enthusiastic aspirant for fame as an explorer. He freighted the steamer 'Diana,' and fitted her out at Dundee, solely at his own expense; intending to ascertain whether regular communication could be established between Europe and the river Obi. He also desired to obtain intelligence of, and bring succour to the Austro-Hungarian Arctic Expedition, the proceedings of which form the subject of the next chapter; and Mr. Leigh Smith forwarded a large quantity of provisions to the 'Diana,' for the special use of the Austrian explorers, in case Captain Wiggans should fall in with them.

The 'Diana' sailed from Dundee on June 4, 1874, and reached Burroughs[1] Strait on the 26th. There was little or no ice in the strait, which Captain Wiggans entered, and then coasted along the Yalmal peninsula, where the ice was found to be three or four miles from the coast. The land was, at that time, free from snow, and presented a pleasing appearance, the ground being covered with moss and wild flowers. But farther north the pack ice was close along the shore, and the 'Diana' was detained by it, for three weeks, in a locality where a number of Norwegian schooners were engaged in sealing and walrus hunting. Early in August the ice drifted from the land, and the little steamer was enabled to advance as far as the entrance of the Gulf of Obi. Here Captain Wiggans took observations, and discovered that White Island, off the entrance of the gulf, was placed very much too far to the eastward on the charts. He stood across the gulf for about twenty miles, but encountered a strong current, with dirty weather, which induced him to abandon the idea of a farther advance. The steam power of the 'Diana' was insufficient to resist the force of the stream, and there was additional danger from the inaccuracy of the chart, and the shoalness of the water.

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[1] Improperly called Kara and Waigat Strait. See pp. 5 and 7.

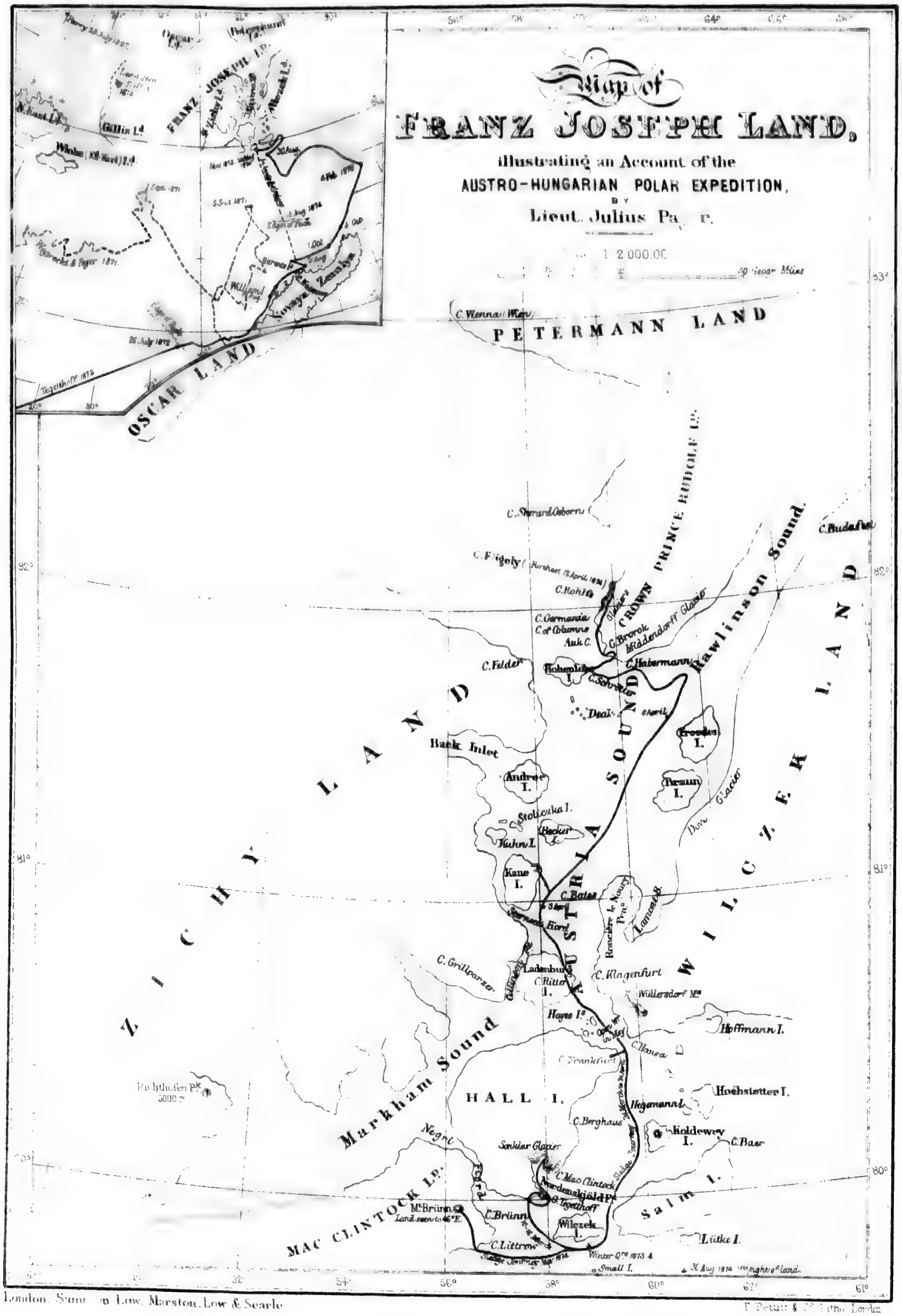
On returning to White Island, it was found that the ice was again pressing close upon the land, and the 'Diana' was once more detained by it for three weeks. At the same time there was open water to the north, and in the direction of Cape Chelyuskin. At last, on August 25, White Island was cleared, and on going south for a few miles it was found that the sea of Kara was quite clear of ice, which had all drifted away to the northward. Captain Wiggans steered direct for Burrough Strait ; the other object of his voyage being to afford succour to the Austro-Hungarian Expedition. Accordingly he shaped his course to the western side of Novaya Zemlya; and on August 30 was at Kostin Shar, whence he bore up for Vardo; but, encountering a gale of wind when off that port, he eventually steamed for Hammerfest, arriving there just an hour before the members of the Austro-Hungarian Expedition.

Captain Wiggans returned to Dundee on September 25, 1874, after an interesting cruise. He gathered from the Norwegians that the sea of Kara was usually free of ice until the middle of October; and he considers that there might be regular steam communication between England and the mouth of the Obi. His further suggestion that a survey of the sea of Kara and the Gulf of Obi should be undertaken, is well worthy of favourable consideration from the Russian Government.

CHAPTER XIII.

THE AUSTRO-HUNGARIAN ARCTIC EXPEDITION.

THE Austro-Hungarian Expedition is the only one, since England temporarily retired from the field, which has materially increased our knowledge. It was preceded by a daring preliminary voyage, undertaken by Captain Weyprecht and Lieutenant Julius Payer. The latter officer had served with Koldewey on the east coast of Greenland, and had previously achieved some fame as an Alpine climber. The plan of these two energetic explorers was to follow the Gulf Stream into the supposed Polar Basin, by keeping to the eastward of Spitzbergen. They sailed from Tromsö on June 21, 1871, in a small hired vessel of 70 tons, and a crew, all told, of eight men. They attempted to reach Gilies Land by following the eastern coast of the outermost islands of the Spitzbergen group. On August 21, they had reached latitude 77° 17′ N., between the 28th and 36th degrees of east longitude, where the ice was lighter than any they had previously met with. The vicinity of land was proclaimed by the decreasing depth of the sea, and by



London, Sampson Low, Marston, Low & Searle

F. Petau & Co. Litho. London

of land was proclaimed by the decreasing depth of the sea, and by numerous bear tracks on the ice. The fogs were so thick that they could not see far, but they seem to have been beating about for some days in perfectly navigable ice, in 77° 30′ N. On August 30 they passed the 42nd meridian, in latitude 78° 25′ N. without seeing ice; but that night they came to the edge of the pack, which seemed to be moving north-east; and in the evening of the 31st they were in 78° 41′ N. Very thick fog, with a stiff contrary wind, prevented them from getting farther north; and they inferred the near neighbourhood of land from the quantity of drift-wood, not very far north of their position on the 42nd meridian. They were, in fact, approaching the land which they discovered in their subsequent voyage. The explorers then sailed east until they sighted Novaya Zemlya, and returned to Tromsö on October 4, 1871.

The deductions from this preliminary voyage induced Captain Weyprecht and Lieutenant Payer to select the route by Novaya Zemlya and the Siberian coast, with the object of making a north-east passage, for their next effort. The idea of an Austro-Hungarian Arctic Expedition was received with enthusiasm by the whole Austrian empire. The command of the ship was entrusted to Captain Weyprecht, and that of the land travelling to Lieutenant Julius Payer. The former officer is an experienced and accomplished seaman; the latter is a tried Alpine climber, a good draughtsman, and a resolute and enthusiastic explorer. The steamer 'Tegethoff,' of 300 tons, was fitted out in the Elbe, with every modern appliance, and Lieutenant Payer received much assistance from Sir Leopold McClintock in preparing for the organisation of the sledge travelling parties. That veteran Arctic seaman, Captain Carlsen, joined the expedition as pilot. Dr. Kepes, the surgeon, is a Hungarian. Most of the crew were Dalmatians, from the Adriatic; and there was great confusion of tongues on board the 'Tegethoff'—Italian, German, English, Norwegian and Sclavonic, were all spoken. Captain Carlsen gave his orders in Norwegian, with forcible Italian expressions occasionally thrown in. Dr. Kepes talked to the crew in Latin and Hungarian; and two men spoke a very curious dialect, the German of the Tyrol, which Lieutenant Payer alone understands. Count Wilczek, in the small yacht 'Isbyörn,' accompanied by Baron Sterneck, a geologist named Hans Höfer, Herr Berger a photographer, and the Count's huntsman, went as far as the Novaya Zemlya coast. The intention of the explorers was to round the north-eastern point of Novaya Zemlya, and press eastward to the most northern point of Siberia, where they would winter. In the following year they hoped to continue the voyage to Behring Strait;

thus completing a most important and interesting voyage, while during the spring the sledge travelling parties, equipped on McClintock's system, would make exploring journeys and achieve geographical discoveries, perhaps, along the unknown coasts of Wrangell Land.

The 'Tegethoff' left Bremerhafen on June 13, and, all preparations having been completed, she steamed out of Tromsö Harbour on July 14, 1872, with Captain Carlsen as pilot. The first ice was encountered on the 25th, in latitude 74° 15′ N., and on the 29th the coast of Novaya Zemlya was sighted. Here the vessel was beset, but steam was got up, and, by repeated charges, she was extricated, and reached a lane of water about twenty miles wide, to the north of Matochkin Strait. Much ice was met with on the following days, and on August 12 the 'Isbyörn' yacht joined company, with Count Wilczek and his companions on board. On the 13th the two vessels anchored about two cables' lengths from the shore, in latitude 76° 30′ N., and the 18th was a gala day, being the Emperor's birthday. Covers were laid for twelve, and the *mênu* comprised a haunch of reindeer, bear steaks, six bottles of Moselle, six of Hungarian wine, six of Champagne, and a large Christmas-pudding. Every day three or four sledge parties made excursions to the adjoining island, and returned with quantities of fire-wood, geological and botanical specimens, and spoils of the chase. On the 23rd, the north wind set in with great force, and the young ice began to form. The vessels then parted company. The 'Tegethoff' steamed away north on her gallant voyage of discovery, while the 'Isbyörn' endeavoured to push southwards along the coast. She passed the Kostin Shar on the 26th; and on reaching the mouth of the Petchora, Count Wilczek and his friends left the vessel, which proceeded on her return voyage to Tromsö, while they sailed up the Petchora, in small boats, finally reaching Perm, and returning home by Moscow.

Herr Höfer's geological observations lead him to connect Novaya Zemlya with the Ural system. Meterological observations were also carefully taken, and a collection of 150 photographic views has been made.

The season of 1872 was exceptionally severe, and large quantities of ice were encountered where, in more favourable seasons, the sea had been clear of any obstruction. Still Captain Weyprecht and his gallant companions were full of hope, and looked forward to being able to advance to the eastward, so as to winter near Cape Chelyuskin, the most northerly Siberian promontory. The 'Tegethoff' was last seen by Count Wilczek on August 23, 1872, pushing her way, with the aid of steam, round the northern coast of Novaya Zemlya. But she was closely beset almost immediately afterwards, and was never again extricated from the ice. The events of the next two years will be best described in Lieutenant Payer's own words. He says:—

'Our position was sufficiently miserable, but on October 13 it became gloomy in the extreme. On that day the lethargy in which everything around us had so long been buried suddenly gave place to active commotion, and thenceforth we were exposed to the fearful pressure of the ice. Many a time we were summoned to be ready to save ourselves in case of the vessel foundering, and all this in the midst of a Polar night, and without knowing whither to turn for safety. Our vessel, however, bravely withstood the pressure, though the floe upon which it was fixed had been uplifted by others, which had forced their way under it, thus raising her aft, and causing her to lean over on the port side.

'Preparations for passing the winter had by this time been made. The deck was covered with snow, an awning was spread from the mainmast forward; and a rampart of ice fixed round the ship. The latter required to be repaired frequently, in consequence of the havoc caused by the motion of the ice.

'Special care was taken to keep the crew employed. Watches were set regularly, exercise was taken, and school kept. On Sundays the members of the expedition met for a simple but impressive Divine Service under the awning, when the Bible was read in Italian, by the light of a train oil lamp.

'Meteorological observations were made regularly; Lieutenant Brosch, Midshipman Orel, Captain Carlsen, Lusina, and Krisch, relieving each other every two hours. The uncertainty of our position rendered it necessary to keep a watch constantly on deck, through whom we were regularly informed of the approach of ice bears, whose flesh formed a most important addition to our diet. Nevertheless, the sanitary condition on board during the first winter left much to be desired, so that our excellent surgeon, Dr. Kepes, was fully occupied. Scurvy and affections of the lungs made their appearance in spite of every precaution, the former partly on account of the occasional congelation of the damp covering our cabin-walls, and partly owing to mental depression brought on by our critical position, and which only disappeared when our prospects became more hopeful, and the summer's work kept every one fully occupied.

'Our small stock of wine was reserved for the use of the sick. The rest contented themselves with a daily allowance of artificial wine, which we prepared on board from glycerine, sugar, meat extract, tartaric acid, alcohol, and water. A small plank, suspended over the cabin stove, supplied us every week with a little cress and cabbage for the scorbutic. The dogs—whose numbers by that time had been reduced to seven—were lodged on deck, in boxes filled with straw. They were fed, at first, with dried horse-flesh, and subsequently on the flesh of seals and bears.

'On October 28 the sun disappeared below the horizon, not to rise again for 109 days. All the birds had left us, and during five long winter months we were obliged to burn lamps in our cabins. For weeks it was next to impossible to leave the ship. The Polar night was rarely of that indescribable clearness which has been noticed on land, and by ourselves on the coast of Greenland. Whenever a sudden change of temperature caused the expanse of ice to break up, dense vapours arose from the fissures, which not only further obscured the generally inky sky, but likewise produced that immense amount of precipitation which we experienced, especially during our second winter. A fine snow fell almost continuously. In the course of the winter of 1873–4 it attained a depth of 12 feet, and on the arrival of spring our vessel was completely buried in it, although nearly the whole of the snow which fell during the preceding winter had disappeared during the summer.

'Our observations on the evaporation of the ice during the Polar night agree in the main with the results obtained by Parry on Melville Island. The winds nearly balanced each other as regards direction as well as force.

'A hut of coal had been built on the ice, to serve as an asylum in case of the vessel being lost, but it was destroyed by a movement of the ice on Christmas Eve, and we considered ourselves fortunate in being permitted to spend Christmas Day itself in undisturbed tranquillity, occupied with thoughts of home.

'The first day of the new year brought with it no prospect of an early release. We were still drifting towards the north-east, and even imagined that we might be carried to the coast of Siberia. Fate, however, had ordained otherwise, for after we had crossed the 73rd degree of longitude, the wind shifted, and thenceforth, helpless as before, we drifted towards the north-west.

'On February 16 the sun again made its appearance above the horizon, and on the 25th the pressure of the ice, which had tormented us hitherto, having literally hemmed us in by a wall of craggy ice-mountains, ceased as suddenly as it had begun. The cold continued to be severe: the mean temperature of February was — 31° Fahr., and towards the close of that month it reached its height — 51° Fahr. But this cold is borne easily, as the cabin affords ready means for warming one's self, and consequently several of our men only reluctantly put on their fur clothes when ordered on deck.

'The Polar lights in their ineffable beauty illumined the heavens during the whole of the winter, but diminished in frequency as the days grew longer. They generally appeared in the south, and only rarely was more than one corona seen on the same night. After the beginning of September they were the only incitement which we received from without. Like mighty streams they rushed over the firmament, sometimes from west to east, at others in a contrary direction, and the corona vanished as rapidly as it appeared. They were most intense between 8 and 10 in the evening, and their appearance was never attended by noise. Magnificent lights proved generally the forerunners of bad weather.

'The auroras and magnetic phenomena were observed by Lieutenant Weyprecht, who will publish the results at an early date.

'In the summer of 1873 our hopes of an early disruption of the floe, and consequent liberation, revived. In the course of the summer we observed a maximum temperature of 45°·5 Fahrenheit; the black bulb thermometer occasionally indicating a solar heat of 113° Fahrenheit, and on days like these, when there was no wind, we had a sensation of stinging heat. The mean temperature of the past year had been 2·75° Fahrenheit. Our hopes were based upon the evaporation of the ice caused by the powerful effect of the sun, and upon its destruction by winds and waves, but not upon its melting in a sea the surface temperature of which never rose above freezing point. The progressive conversion of the surface ice into sludge was witnessed by us from day to day, the cliffs and walls of ice crumbling away, and evaporating until nearly the whole surrounding sea was covered with a thick chaotic layer of sludge.

'Thus encouraged, we made fresh efforts to regain our liberty, and the months of May, June, July, and August were spent in futile attempts to saw through the ice which surrounded us. But our floe, which had attained a thickness of forty feet in consequence of other floes forcing themselves underneath it, rendered all our attempts futile. The centre of our vessel, and the uplifted part abaft, remained immovably fixed upon the floe. The surrounding ice and snow having melted away and evaporated to the extent of 12 to 18 feet, we found ourselves fixed at a considerable elevation above the general level, and the danger of being capsized had to be provided against by supporting our masts with strong shears. I ought to state that our floe varied considerably in size from time to time. During the last winter it was shattered almost daily, but congealed again immediately. At the time now referred to (August 1873) it was 5 to 7 miles in diameter.

'The northerly winds of July drifted us to the south, as far as latitude 79°, but August saw us again drifting to the north. I ought to state distinctly that nothing justified us in the assumption that the direction of our drift was at any time due to oceanic currents. The winds alone caused it, and a cessation of the wind led to a cessation in the movement of the ice. It struck us as remarkable that the direction in which we drifted was always to leeward, and that our vessel should have slued only to the extent of 1° in azimuth during the four preceding winter months.

'In the course of the summer of 1873, when in about 79° N. latitude, and 60° E. longitude, we drifted over an extensive bank, our soundings, which had hitherto varied between 100 and about 275 fathoms, becoming much less.

'The temperature of the sea was measured at different depths, and the use of the dredging apparatus resulted in a small zoological collection, only a portion of which we were able to bring to Europe. Drawings of some of the specimens which we had to abandon have, however, been made.

'Our hopes that the ice would break up grew less and less every day, though the familiar grating sound which proceeds from the ice giving way was heard frequently, and dark streaks on the horizon pointed to the existence of open fissures. We had already resigned ourself to the necessity of being obliged to pass a second winter, as inactive and perilous as the first, when the state of affairs all of a sudden underwent a change in our favour.

'We had long ago been drifted into a portion of the Arctic Sea which had not previously been visited, but in spite of a careful look-out, we had not been able hitherto to discover land. It was, therefore, an event of on small importance, when, on August 31, we were surprised by the sudden appearance of a mountainous country, about 14 miles to the north, which the mist had, up to that time, concealed from our view.

'At that moment all our past anxieties were forgotten; impulsively we hastened towards the land, though fully aware that we should not be able to get farther than the edge of our floe. For months we were doomed to suffer the torments of Tantalus. Close to us, and, in fact, almost within reach, was a new Polar land, rich with the promise of discoveries, and yet, drifting as we were at the mercy of the winds, and surrounded by open fissures, we were unable to get any nearer to it.

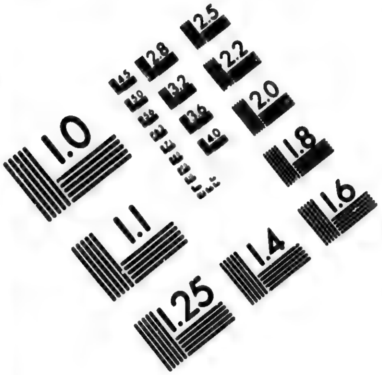
'At length, towards the end of October, we approached within three miles of one of the islands lying off the main mass of the land. Every other consideration was now thrown to the winds, and, making our way over the rugged, hummocky surface of the ice, we, for the first time, placed our foot upon land in latitude 79° 54′ N. The ice covering the sea close to the shore was only one foot in thickness, and it was clear that an open lane of water had existed periodically during the preceding summer. An island more desolate than that which we had reached can hardly be imagined, for snow and ice covered its frozen and débris-covered slopes. But to us it was of such importance that the name of Count Wilczek, the originator of our expedition, was conferred upon it.

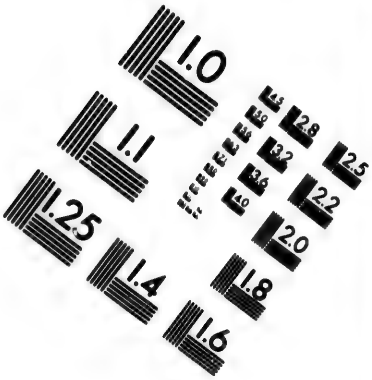
'The sun had deserted us for the second time on October 22, but we availed ourselves of the few hours of twilight, vouchsafed to us for a week afterwards, to make a few excursions to a distance of 10 miles from the vessel, without, however, being able to enlarge our knowledge of the new country. Was it merely the southern capes of islands of small extent which we had before us, or a country of large extent? Nor were we able to determine whether the white patches, which we discerned high up between the mountain summits, were glaciers or not.

'The increasing darkness of the polar night for the present rendered every attempt at exploration impossible, and we feared lest northerly winds might drift us far away from our present position, before the approach of spring should enable us to commence our exploratory journeys. Nor was our position at the time at all a safe one. Southerly winds had driven us close to the land, and during the first half of October we still suffered seriously from the pressure of the ice. Our floe was shivered into fragments, and it almost appeared as if the anxious days through which we had passed were about to return. In expectation of an unfortunate issue, we took the same measures of precaution which we had taken during the preceding winter, and were ready to leave the ship at a moment's notice. Fortune, however, did not again forsake us, and we were permitted to pass the second Polar night (125 days in length) without suffering the horrors of the first. There occurred no farther pressure from the ice, and our harbourless vessel, fixed to its floe, and surrounded for the first time by icebergs, remained immovable, close within the outer edge of the land-ice, and at a distance of 3 miles from the nearest coast.

'This position enabled us to look towards the future with a certain amount of assurance; it rendered existence more endurable, and enabled Weyprecht, Brosch and Orel to determine the magnetic elements with a great amount of accuracy. Orel, moreover, determined the astronomical position of our winter-quarters, which he found to be in latitude 79° 51 N., and longitude 58° 56′ E. During the winter of 1873-74 much more snow fell than during the preceding one, and snow-drifts brought on by northerly winds continued for days. At the height of the polar night we were scarcely able to distinguish night from day, and were enshrouded in darkness for weeks. Christmas was celebrated in a snow-house, built upon our floe. In January the cold set in again exceedingly severe, and the mercury remained frozen for more than a week. The snow became as hard as pumice, and its surface granular. The petroleum in the glass lamps under the awning froze, the lamps went out, and even our cognac was changed into a solid mass.

'The visits of bears were as frequent then as they had been at other seasons of the year; they came close up to the ship, and were killed by regular volleys fired from deck. The bears here are certainly much less ferocious than those we met with in Eastern Greenland, where they not unfrequently attacked us, and on one occasion even carried one of the crew out of the ship. Here they generally took to flight as soon as we made our appearance. With respect to the disputed question whether bears pass the winter in a dormant state or not, we observed that amongst the greater number shot by us during two winters there was not a single female, and during our second sledge expedition, in the spring of 1874, we even discovered a tunnel-shaped winter-hole in a snow-cone lying at the foot of a cliff, which was inhabited by a female bear and her cubs. On





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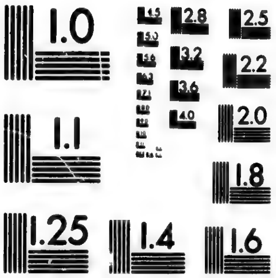

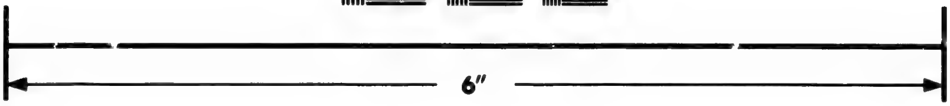

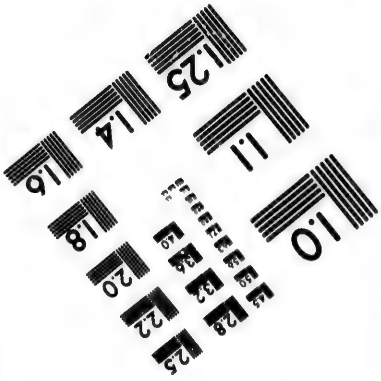

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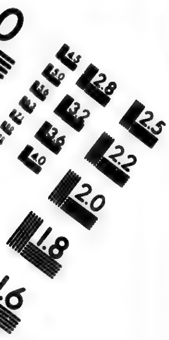
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encountering bears we found it generally most advantageous to fire after they had approached within a distance of 50 or 80 paces.

'A portion of the flesh of sixty-seven ice-bears which we killed, amounting altogether to about 12,000 lbs., proved to be the most efficient remedy against the scurvy, from which several of our men were again suffering. The care of our surgeon, as well as the re-appearance of the sun on February 24, saved most of our patients from protracted suffering; but owing to our stock of medicines having become very much reduced, a third winter would certainly have exhibited far more unfavourable results. This consideration, joined to the certainty that our vessel was indissolubly fixed to the floe, which in the ensuing summer would again drift about at the mercy of the winds, as well as the danger of its capsizing on the melting of the snow, led to the resolution to abandon the vessel, towards the end of May, and attempt a return to Europe by means of our boats and sledges. The interval was to be devoted to an exploration of the country by means of sledge expeditions, the fortunate termination of which must be left, in no small measure, to chance. For had the vessel been drifted away during the absence of the explorers, they would have been exposed to certain destruction, and the crew remaining on board would have been weakened seriously. But the exploration of the country, lying as it did so invitingly before us, was considered to be worth the risk.

'March had arrived, and although the cold was still severe, and the weather by no means favourable, the necessity of making the best of the short space of time at our disposal induced us to start upon our first sledge expedition. On March 10 the Tyrolese Haller and Klotz, the sailors Cattarinich, Lettis, Pospischill, and Lukinovich, three dogs and myself, left the 'Tegethoff' with our big sledge. We travelled in a north-westerly direction along the coast of the extensive Hall Island, ascended Capes Tegethoff and McClintock, 2,500 feet in height, and traversed the picturesque Nordenskjöld Fiord, the interior of which was bounded by the gigantic ice-wall of the Sonklar glacier. The land before us appeared to be utterly void of life; immense glaciers looked down upon us from between the desolate mountains, which rose boldly in steep doleritic cones and plateaus. Every object around us was clothed in a mantle of glaring white, and the ranges of columns of the symmetrical mountain terraces looked as if they were encrusted with sugar. In no single instance could we see the natural colour of the rock, as in Greenland, Spitzbergen, or Novaya Zemlya. This was owing to the immense precipitation and the moisture of the air, which condensed on coming into contact with the cold surface of the cliffs. The unusual moisture of the air, moreover, caused us frequently to over-estimate distances, which is quite contrary to Arctic experience. Perfectly clear days were exceedingly rare.

'The cold during this journey was very great, and amounted on one occasion to — 58° Fahrenheit (on board ship it was — 46·25° Fahrenheit). We were bound to exercise the greatest precaution; our nightly rest in the tent was disturbed, and the crossing of the Sonklar glacier, during a slight wind, was exceedingly painful. Our clothes were as stiff as a coat of mail, and even our rum, strong as it was, appeared to have lost both potency and fluidity. We slept in fur coats, but in the daytime we found that clothes made of the skins of birds were best adapted for resisting the rigour of the climate. In spite of every precaution, however, we suffered much from frost-bites, against which a mixture of iodine and collodion proved most efficacious.

'Immediately on our return to the vessel, on March 16, we set about making preparations for a second sledge expedition, which was to extend over thirty days, and was to be devoted to an exploration of the land in the north. Soon afterwards one of our companions (Mr. Krisch, the engineer) succumbed to a protracted tuberculosis of the lungs, aggravated by scurvy. On the 19th we buried him in a lonely spot surrounded by columnar basalt, and erected a wooden cross upon his grave.

'On March 24 we started for the north. Our party included Mr. Orel, the two Tyrolese, three sailors (Zaninovich, Sussich, Lukinovich), and myself. We all wore snow spectacles, blinkers, masks covering half the face, knitted woollen gloves, and sail-cloth boots. We were armed with double-barrelled Lefaucher rifles, having a calibre of 12^{mm} and firing explosive bullets and steel-pointed projectiles. In preparing our equipment we followed explicitly the advice given by Admiral Sir Leopold McClintock, and the successful issue of our expedition is due, largely, to this circumstance.

'Our team of dogs, unfortunately, was not any longer complete, and only three of them assisted us in dragging the large sledge, which carried stores and provisions weighing 16 cwts. The rest of the dogs were either dead or incapable of rendering service, but even the three remaining ones, being powerful animals, proved valuable auxiliaries.

'The temperature during this journey, quite contrary to our expectations, did not fall below 26·50° Fahrenheit, but snowdrifts and moisture, the opening of fissures in the ice, and the flooding of our path by the sea, gave us much trouble.

'The results of this journey cannot be fully appreciated without reference to maps and sketches;

and, anticipating the chronological order of our report, we will at once state that the newly discovered country equals Spitzbergen in extent, and consists of several large masses of land—Wilczek Land in the east, Zichy Land in the west—which are intersected by numerous fiords, and skirted by a large number of islands.

'A wide sound—Austria Sound—separates these masses of land. It extends north from Cape Hansa to about latitude 82° N., where Rawlinson Sound forks off towards the north-east. The latter we were able to trace with the eye as far as Cape Buda-Pest.

'The tide rises about two feet in Austria Sound, and exercises but a small effect, merely causing the bay-ice to break near the coasts. Dolerite is the prevailing rock. Its broad horizontal sheet and the steep table-mountains, which recall the Ambas of Abyssinia, impart to the country its peculiar physiognomy. Its geological features coincide with those of portions of North-Eastern Greenland. A tertiary carboniferous sandstone occurs in both, but only small beds of brown-coal were discovered. On the other hand, amygdaloid rocks, which are so frequent in North-Eastern Greenland, were not met with in Franz-Josef Land, and whilst the rocks in the south were frequently aphanitic in their texture, and resembled true basalt, those in the north were coarse-grained and contained nepheline.

'It is an established fact that portions of North-Eastern Greenland, Novaya Zemlya, and Siberia, are being slowly upheaved, and it was therefore very interesting to meet with raised beaches along the shores of Austria Sound, which attested that a similar upheaval was taking place here likewise.

'The mountains, as a rule, attain a height of 2,000 or 3,000 feet, and only towards the south-west do they appear to attain an altitude of 5,000 feet. The extensive depressions between the mountain-ranges are covered with glaciers of those gigantic proportions only met with in the Arctic Regions. Only in a few instances were we able to determine the daily motion of the glaciers by direct measurements. On the coast they usually form mural precipices, 100 to 200 feet in height. The Dove Glacier on Wilczek Land is undoubtedly one of the most considerable of the Arctic Regions.

'The glaciers visited by us were characterised by their greenish blue colour, the paucity of crevasses, an extraordinarily coarse-grained ice, a small development of moraines, slow motion, and the considerable thickness of the annual layers. The *névé*, or glacial region above the snow-line, was much less elevated above the sea than in Greenland or Spitzbergen.

'Another peculiarity which characterises all the low islands in the Austria Sound, is their being covered by a glacial cap.

'The vegetation is far poorer than that of Greenland, Spitzbergen, or Novaya Zemlya, and excepting in the Antarctic Regions, no country exists on the face of the earth which is poorer in that respect. The general physiognomy of the flora (but not that of the species) resembles that met with in the Alps at an altitude of 9,000 or 10,000 feet. The season during which we visited the country was certainly that in which vegetable life first puts forth its appearance, and most of the slopes were still covered with snow, but even the most favoured spots near the sea-level, which were no longer covered with snow, were unable to induce us to arrive at a different conclusion. On level spots we scarcely met with anything but poor and solitary bunches of grass, a few species of saxifrage and *Silene acaulis*. Dense carpets of mosses and lichens were more abundant, but most abundant of all was a lichen, the winterly *Umbilicaria Arctica*.

'Driftwood, mostly of an old date, was met with on many occasions, but only in very small quantities. We once saw, lying only a trifle higher than the water-line, the trunk of a larch, about a foot thick and some 10 feet in length. The driftwood, like our vessel, had probably been carried to these latitudes by the winds, in all likelihood from Siberia, and not by currents.

'The country, as might have been supposed, has no human inhabitants; and in its southern portion scarcely animal, excepting ice-bears, are met with.

'Many portions of the newly-discovered country are exceedingly beautiful, though it bears throughout the impress of Arctic rigidity.

'Our first sledge journey, as well as those undertaken subsequently, convinced us of the difficulty which any future expedition would meet with in discovering a harbour to winter in, no locality suitable for such a purpose having been discovered by us.

'It has always been a maxim of Arctic explorers to name their discoveries in honour of the promoters of their enterprise, or of their predecessors. The countries discovered may never become of commercial importance, but the only manner in which I was able to record my gratitude towards those who had devoted their means to the success of our expedition, consisted in connecting their names with the newly-discovered countries. The name of H.I.M. Franz-Josef was consequently bestowed upon the whole of the country discovered by us, and other names to its several parts.

'Owing to the mist which generally hung over the ice, we should not have been able to trace the northerly direction of the Austria Sound, had we not frequently ascended high mountains. The ascents of Capes Koldewey (80° 15′), Frankfurt (80° 25′), Ritter (80° 45′), Kane (81° 10′), and Fligely (82° 5′), moreover enabled us to survey the surrounding country, and to select the most suitable tracks to follow.

'An uninterrupted expanse of ice, with numerous icebergs scattered over its surface, extended from coast to coast. It was evidently of recent formation, and numerous fissures, and barriers formed of hummocks, crossed it in many places, and constituted serious obstacles to our progress, which we were able to surmount only at a vast expenditure of time and labour. Our track led over this expanse of ice; and, starting from Cape Frankfurt, at the portal of Austria Sound, it led us through regions with respect to which we had learnt nothing during our first sledge journey. Omitting, for the present, all details concerning our journey, it may suffice us to state that we crossed the 80th degree of latitude on March 26, reached the latitude of 81° on April 3, and observed, five days afterwards, the latitude of 81° 37′. We imagined at that time that we had approached nearer to the Pole on land than had ever been done before, for we were not then aware that the American Expedition under Hall had reached 82° 9′ N. on land, and 82° 26′ by sea, the year before.

'To the south-east of Crown Prince Rudolf Land we turned into the vast Rawlinson Sound, which promised to lead us almost straight to the north. But we soon got entangled in a chaotic mass of ice, which, owing to its height, prevented us from seeing the land, and through which it required our utmost exertions to force our way. The small horizontal intensity of the needle, moreover, which is but natural in such a high latitude, repeatedly made us lose our way, and finding that the hillocks of ice became more formidable in proportion as we advanced, we changed our course, and returned to Austria Sound. We frequently encountered ice-bears whilst in Rawlinson Sound. They came towards us whenever they caught sight of us, and fell an easy prey to our rifles.

'The decrease of our provisions and the want of time at our disposal made forced marches necessary, and necessitated a separation of our party. The large sledge, with Haller and four others, was left behind in latitude 81° 38′, under a cliff of Hohenlohe Island, whilst Orel, Zaninovich, and myself, with the dog-sledge and half the tent, continued the journey. The sledge was now drawn by two dogs only, the third, a Lapland reindeer dog, having some time previously perished in a snow-storm. Haller was ordered to wait a fortnight for our return, and then to make the best of his way back to the vessel.

'Our first aim was to cross Crown Prince Rudolf Land in a northerly direction. This necessitated our crossing the extensive Middendorf Glacier, which past experience and the great cold justified us in believing to be possible, and we at once set about it. After a laborious journey along the long terminal cliff of the glacier, we at length succeeded in gaining its surface, but had scarcely proceeded a hundred paces, when an immense crevasse swallowed up Zaninovich, the dogs, and the heavily-laden sledge. Mr. Orel, fortunately, had remained some distance behind, and I escaped a similar fate by cutting through my harness. Not being able by myself to extricate those engulfed, I ran back to Hohenlohe Island, 12 miles distant, whence I quickly returned with the rest of our party. By means of long ropes we succeeded at length in raising man, dogs, and sledge to the surface, and were fortunate in being able to continue our journey on the following day without having sustained serious injury. The men returned to the depôt; and our small party, having abandoned the treacherous surface of the glacier, gained the western coast of the island by a circuitous path, along which we travelled to the north. Here we were destined to witness a most striking change in the aspect of nature. A water sky, of a dusky colour, made its appearance in the north; foul, yellow vapours collected below the sun, the temperature rose, the ground under our feet became soft, and the snow-drifts broke under us with a rumbling noise. We had previously noticed the flight of birds from the north—here we found the rocks covered with thousands of auks and divers. They rose before us in immense swarms, and filled the air with the noise of their vehement whizzing, for breeding-time had arrived. Traces of bears, hares, and foxes were met with everywhere, and seals reposed sluggishly upon the ice. We were justified, therefore, in believing that open water was near at hand; but personal observations which we were able to make on the following day, after we had ascended the hills, and the results of which I have embodied in a sketch, showed that even our not very sanguine expectations, as regarded the extent of open water, were not realized.

'Our track, henceforth, was far from safe. We were no longer travelling over old ice, but over a crust of young ice, hardly 1 or 2 inches thick, covered with salt, very flexible, and crossed by veritable walls, built up of fragments resulting from recent fractures of the ice.

'We tied ourselves to the rope, carried our things separately, opened a path with the axe, and continually examined the thickness of the crust which bore us.

'We rounded Auk Cape, which resembled a gigantic aviary, and reached the two lonely rocky towers of the Cape of Columns. Here we first found open water extending along the coast.

'This distant world was sublime in its beauty. From a height we looked down upon the dark sheet of open water, dotted with icebergs like so many pearls. Heavy clouds hung in the sky, through which penetrated the glowing rays of the sun, causing the water to sparkle, and above was reflected the image of another sun, but of a paler hue. At an apparently immense height the ice-mountains of Crown Prince Rudolf Land, bathed in a roseate hue, stood out clearly visible through the rolling mists.

'April 12, was the last day of our advance to the north, and, although not perfectly bright, it was more so than most of its predecessors. The thermometer stood at +54·50° Fahrenheit.

'From the Cape of Columns, owing to the open water referred to, it was not any longer practicable to travel over the ice, and we were compelled to take to the hills.

'On starting, we buried our baggage in the crevasse of a glacier, in which we had slept, and where it was safe from prowling ice-bears, and with the dog-sledge we travelled over a snow-field towards the hills, which were 1,000 to 3,000 feet in height. On reaching the prominent, rocky Cape Germania, I observed the meridian altitude (81° 57′ N.). Here we left the sledge, and, tied to the rope, crossed the *névé* of a glacier, which descended in gigantic steps towards our left. But the many crevasses which obstructed our path, and into which we broke frequently, as well as the certainty of having reached latitude 82° 5′ N. after a march of 5 hours since noon, induced us to abandon farther discovery, and having pushed to the north for seventeen days, we halted on the height of Cape Fligely.

'We were now in a position to judge of the extent of coast-water. It turned out to be a "Polynia," bounded by old ice within which floated ice-masses of recent formation.

'As I am anxious on this occasion to confine myself to a record of facts, I abstain from entering upon a discussion concerning the navigability and nature of those portions of the Arctic Ocean which have not hitherto been seen by anyone.

'There cannot, however, be any doubt that the facts observed and the sight upon which we looked from Cape Fligely, spoke as little in favour of the theory of these who believe in the existence of an open Polar Sea, as of those who maintain that the Polar basin is covered with ice throughout the year. The truth will probably be found to lie between these two extremes. The hope of finding a navigable sea in latitudes not hitherto attained is not yet extinct, and is most likely to be realised by hugging the coast, but depends in a large measure upon a favourable year.

'The success of an expedition sent out to attain the highest possible latitude depends, moreover, largely upon the route selected. The plan of penetrating through Smith Sound, which has been advocated in England, appears to offer most advantages in these respects. The theoretical reasons adduced in favour of this route are seconded most powerfully by the fact that a very high latitude has been reached here on repeated occasions. If an expedition should succeed in reaching a winter harbour in a latitude as high as that reached by the last American expedition, it would then be in a position, by means of extensive sledge journeys along the coast, to reach a latitude in the course of spring, the attainment of which would be attended by far greater difficulties along any other route.

'Our own track to the north of Novaya Zemlya carries no weight in considering this question, for we are indebted for our progress to a floe of ice and not to our own exertions. The difficulties which any succeeding navigator would have to contend with on this route may be estimated from the fact, that on our return we found the sea encumbered with ice to such an extent that even boat navigation was hardly possible, and we were obliged to haul up our boats many hundred times, and drag them over the ice. We certainly should not have been able to return in our vessel, although the summer of 1874 was exceptionally favourable.

'But if an expedition be fitted out, not with a view of reaching the highest possible latitude, but to study the nature of Arctic countries, then the interior of Greenland would certainly appear to be deserving of the first consideration.

'But our neighbourhood was at that time of more immediate interest to us than the question of the navigability of a remote portion of the Arctic Ocean. We had before us extensive lands, covered with mountains, and bounding a wide sound, stretching towards the north-east, which we were able to trace as far as latitude 83° N. where the imposing Cape Vienna forms the western extremity of a country upon which I conferred the name of Petermann.

'Crown Prince Rudolf Land extended towards the north-east, its furthest visible point being a cloud-wrapped rocky promontory, in latitude 82° 20′ N., named in honour of Admiral Sherard Osborn.

'Two other localities visited by us, but not on this occasion, were named after two other renowned English navigators, viz., Admirals Collinson and Back.

'We do not desire to start any fresh theory with reference to the distribution of land around the Pole; but the coasts, as well as the gigantic glaciers, certainly gave us the impression of having entered a group of islands of considerable extent.

'The innumerable icebergs met with in all the fiords of Franz-Josef Land formed a remarkable feature, for to the south of it—that is, in the Novaya

Zemlya Sea—scarcely any are met with. We are not in a position to ascribe the presence of these icebergs to ocean currents, though their absence in the Novaya Zemlya Sea would appear to point to their finding an outlet towards the north.

'Having planted the Austro-Hungarian banner upon the farthest point reached by us, and deposited a document testifying our presence in a cleft of the rocks, we turned back towards our vessel, which lay some 160 miles to the south.

'Having rejoined our comrades, who anxiously waited for our return, at Hohenlohe Island, forced marches, and a deliverance from all impediments, excepting the tent and provisions, soon brought us to lower latitudes. But after we had crossed the glaciers of the imposing Ladenburg Island, and reached Cape Ritter (April 19), we were disquieted by the observation that the sea water had permeated the lower layers of snow, whilst a dark water sky hung over the broad entrance to the Markham Sound. On retiring to rest we distinctly heard the grinding noise of the ice, and the surge beating against the shore.

'The next day found us on an iceberg, not far from the Hayes Islands, with open water in front of us, and no boat to cross it. The water set rapidly towards the north, owing, probably, to the tide. The southern portion of Austria Sound had been converted into a 'polynia,' and at a distance of thirty paces from where we stood the surf lashed the ice. After wandering about for two days, during a fearful snow-storm, we managed, by following the land and the mural terminations of glaciers to get round this open water, which shut off our return, and it was with a feeling of deliverance that we again stepped upon the solid ice near Cape Frankfurt. Our last apprehensions were removed when we found that our vessel had not drifted away; and on April 24 we found the "Tegethoff" on the very spot, to the south of Wilczek Island, where we had left her thirty days before. A few days had necessarily to be devoted to repose; for although we had eaten the flesh of eight bears, which we killed during our journey, this addition to our diet was not sufficient to counterbalance the reduction in our strength brought about by the extraordinary exertions which we were called upon to undergo, when dragging a sledge for eight or ten hours at a stretch, followed by a night's rest of only five hours' duration.

'Our third sledge journey was devoted to an exploration of the extensive McClintock Island. Brosch, Haller, and myself, with the dog-sledge, joined in it. When about 40 miles to the west of our ship we ascended a high mountain, and were able to survey the country as far as about longitude 46° E. It was mountainous in character, the mountains again bearing a great resemblance to the Ambas of Abyssinia. The range attains its culminating point in the Richthofen Peak, about 5,000 feet in height. Closely packed ice covered the sea towards the south, as far as the eye could reach, and rendered our prospects of a speedy return home by no means cheerful.

'On the termination of this journey, Lieutenant Weyprecht measured a base-line on the ice near the ship; and we then considered that we had done everything in our power to accomplish the objects of the expedition, and our thoughts were directed exclusively upon our return home.

'The period immediately before starting was devoted to recruiting our strength. We took leave of the grave of our departed comrade, and of the country which the caprice of a floe of ice had enabled us to discover. On May 20th, in the evening, the flags were nailed to the masts—an affecting scene for all of us—and we started upon our return home.'

When the explorers abandoned the 'Tegethoff' their equipment was of the simplest, for circumstances forbade anything approaching to luxury, and in addition to the clothes he wore upon his back, the personal property of each member of the expedition was limited to a blanket to sleep in. The provisions, ammunition, &c., for three or four months, were packed in three, subsequently four boats, placed on sleighs, and on three large sledges, each weighing about 17½ cwts. Only the two strongest of the dogs were alive, but even this small contingent proved of great service, for they pulled daily 9 to 10 cwts. between them. The deep snow which was encountered on first starting, compelled them to travel as many as five times over certain distances, for it required the united strength of the whole party to drag a single sledge or boat. Having reached the edge of the land ice, they had to clamber with the boats and sledges from floe to floe, and sometimes to cross narrow fissures in the ice. Persistent southerly winds, moreover, destroyed the little progress they made, for these winds drove the ice, upon the surface of which they were travelling, to the north, and after two months of incessant labour they were not more than 8 miles from the ship. It almost appeared to them as if their struggle with the ice would end in a defeat, which would compel them to remain a third winter in their ship, uncheered by a ray of hope.

The ice around them was closely packed, and on several occasions they were compelled to lie quietly with their boats upon a floe of ice for an entire week, until some channel should chance to open. Northerly winds set in at length, on July 15, which dispersed the ice to some extent, continuous rains reduced its dimensions, and by almost superhuman exertions they advanced 10 miles in the course of as many days. They were fully convinced by this time that no vessel would have succeeded in that year, in reaching the land discovered by them.

On August 7 they observed for the first time a swell coming from the south, and indicative of the proximity of open water. This revived their hopes, which fell anew when they again became ice-bound for the space of five days; but on August 14 they reached the edge of the pack, in latitude 77° 40′ N., and their safety seemed thus to be secured. Here they were reluctantly forced to abandon their sledges, and to kill the dogs, who had been their faithful companions and assistants in times of need, for the boats were hardly large enough to hold themselves and baggage, besides which they were without water and provisions for their maintenance.

Their final salvation was due entirely to their finding the edge of the pack-ice in so high a latitude. Favoured by the weather, they crossed the open sea in the direction of Novaya Zemlya, and followed the coast of that island towards the south. On August 18 they for the first time placed their feet upon *terra firma*, near the Admiralty Peninsula, and in the evening of the 24th—that is, after a passage of 96 days—they found themselves in the Bay of Downs (latitude 72° 40′ N.), on board the Russian schooner, 'Nikolai,' Captain Feodor Voronin, who received them with that heartiness which distinguishes the Russian people.

A speedy passage brought them to Vardö; and at 3 o'clock in the afternoon of September 3, 1874, they stepped upon the hospitable soil of Norway, full of that satisfaction which an escape from a position of danger and doubts brings with it.

The complete success of the Austro-Hungarian Arctic Expedition is most encouraging. It furnishes one more proof of the healthiness of the Arctic climate, of the absence of undue risk even when the ship has to be abandoned, and of the important results to be secured by any expedition, when led by an experienced and resolute commander. It is also extremely gratifying to find that Lieutenant Payer, by studying the instructions furnished to him by Sir Leopold McClintock, has achieved great success in sledge travelling. Following the impulse of a generous nature, the very first thing that Payer did, after landing in Norway, was to send the following telegram to McClintock:—'In following your advice, endless advantage. Pray accept thanks. Discovery of land 200 miles north of Novaya Zemlya. Information follows.'

The reception of the members of the expedition throughout Norway was most enthusiastic; and they were warmly welcomed when they reached their own country. Cordial congratulations poured in from all geographers; and on November 10, 1874, Lieutenant Payer read the preceding account of his discoveries at a meeting of the Royal Geographical Society. The brave Austrian explorers have, by dint of careful study, intrepidity, and perseverance, made a great and memorable discovery, of which the Austro-Hungarian nation may well be proud. They failed in their original intention of making the north-east passage; but they ascertained the existence of an extensive mass of land stretching eastward from the North-East Land of Spitzbergen, and probably connected with the Gilies land of the Dutch. This discovery had been predicted by Admiral Sherard Osborn, some years previously; and it clears up several doubtful points connected with the hydrography of the sea between Spitzbergen and Novaya Zemlya. The drift of the 'Tegethoff,' while beset in the ice, was entirely governed by the prevailing winds, and not by any current; and the mass of land to the north finally disposes of the mischievous Gulf Stream and open Polar Basin theory, which has done so much harm to the advance of discovery and the progress of sound geography.

CHAPTER XIV.

THE BEST ROUTE FOR ARCTIC EXPLORATION.

The various expeditions which, within the last three centuries, have touched the threshold of the unknown Polar region along its whole circumference have now been passed in review, and it remains to sum up the evidence thus collected, and to decide from it the best route for future Arctic exploration.

The unknown area is of vast extent, covering several millions of square miles, and, as only a portion can be explored by one expedition, a route must be selected which offers the best security for the acquisition of important results. In order to justify the despatch of a Government expedition, there are two main points to be considered. These are the certainty of exploring a previously unknown area of considerable extent, and the prospect of obtaining the most valuable results in various branches of science. These advantages can only be secured in that portion where a coast-line of great extent is known to exist, because many discoveries must be made on or near the shore. Observations of oceanic currents and deep sea temperature are the only branch of the inquiry which does not depend upon the discovery of land.

As routes by Behring's Strait and the Siberian seas are left out of the question for the present, as regards an English expedition, the number of routes by which the threshold of the unknown region may be passed is reduced to two: namely, the sea between Greenland and Novaya Zemlya, usually called the Spitzbergen route, and Smith Sound at the head of Baffin's Bay. Let us see which of these two means of approach best comply with the essential conditions.

It has been seen that, since the days of Barents (1595), expedition after expedition has vainly attempted to make discoveries by the Spitzbergen route. The Polar pack, constantly drifting south, has hitherto barred all progress in that direction. Very frequently it has been found impossible to proceed farther north than the coast of Spitzbergen in about 80° N., while a very open and favourable season has only enabled vessels to proceed 100 miles farther north, where the threshold of the unknown region is blocked up by the impassable Polar pack. Expeditions making attempts by this route have been led by daring and experienced seamen, and no human means have been wanting to secure success. It may, therefore, be considered as proved that nothing of importance can be achieved by the Spitzbergen route in a sailing vessel. It is, however, supposed that a powerful steamer might succeed where so many sailing vessels have failed, if the season is favourable. This anticipation is, to some extent, well founded. A steamer can more rapidly take advantage of a lead in the ice, can more readily escape from being beset, and can force her way through packed ice which would stop the progress of a vessel under sail. These are undoubtedly great advantages. But they should not be overstated. In an unlucky season, when the ice is closely packed, a steamer could do no more than a sailing vessel, while even under the most favourable circumstances her power of battling with the ice must be limited by the approach of winter. The inevitable conclusion must therefore be, that by the Spitzbergen route, in a bad season, nothing whatever can be done; and in a favourable season a steamer may possibly press one or two or even more degrees farther north than has hitherto been reached, and obtain some valuable deep-sea soundings and temperatures, but no other scientific results in the absence of land. As regards the examination of the area round the Pole, the new Franz-Josef Land may be considered as a portion of the Spitzbergen group

The Spitzbergen route cannot be recommended, because there is no sure prospect of exploring an extensive unknown area, and because no valuable results in geology, botany, ethnology, or geodesy could be obtained under any circumstances.

Let us now turn to the Smith Sound route, by which the vast extent of coast-line on either side of Kennedy Channel, and the ocean which bounds it, must be examined. Details have already been given respecting the navigation of Baffin's Bay, and it has been shown that, humanly speaking, the 'North Water' and the entrance to Smith Sound can always be reached; twenty-one out of twenty-three expeditions have successfully overcome the ice obstructions in Melville Bay. The same success now annually attends the steam whalers. Under the most unfavourable circumstances, therefore, by this route a position can certainly be reached near the entrance of Smith Sound, whence most important discoveries can be made.

Two well-equipped vessels could, during the spring, send out at least two extended sledge-travelling parties, besides depôt parties, which could explore many hundreds of miles of the unknown region in different directions. The extended parties might each be absent 105 days from the ships, and would travel over 1,100 to 1,200 miles of ground. This was what McClintock did in 1853. Mecham, in the same year, was 94 days absent from the ship, and went over 1,006 miles. In 1854 that officer made a still more extraordinary journey. In 70 days he marched 1,157 miles. There were detentions during 8 days, so that in 61 marching-days, going 9 hours a day, he averaged a rate of 16 geographical miles on the outward, and $20\frac{1}{2}$ on the homeward journey. Vesey Hamilton went over 1,055 miles in 71 days, during 1854; in the same year Krabbé covered 863 miles in 71 days; and in 1873 Nares made a journey of 665 miles in 65 days. These are the achievements of the leading travellers of one ship—the 'Resolute' and her tender. At the same time Richards, Osborn, and their juniors, made journeys of similar extent from the 'Assistance.' Sherard Osborn went over 935 miles in 97 days, and Richards was away 94 days, and marched 860 miles. It is easy to perceive that work on this scale in the direction of the North Pole, from a base in 82° or 83° N., would fully secure all the results that are required. A single extended sledge party could take 60 days' provisions and travel over 600 miles. This single sledge, by means of depôts and five auxiliary sledges, can be pushed forward to a distance of about 400 miles from the ship. With an expedition consisting of 120 officers and men, two extended exploring parties could be despatched in each travelling season, and 1,600 miles of land would thus be thoroughly explored, much of which would be new.

The exploration of 50 miles of coast by a sledge party is worth more to science than the discovery of 500 miles by a ship. In the one case the coast is accurately laid down, and its fauna, flora, geology, ethnology, and physical features are fully ascertained; in the other, a coast is seen and inaccurately marked by a dotted line on a chart, and that is all. Take, for example, the shores of the Parry Islands. Parry sailed along them from Wellington Channel to Byam Martin Island in 1819, without landing, and showed them on the chart by dotted lines. For the next thirty-two years that was all that was known about them. In 1851, sledge parties belonging to Captain Austin's expedition travelled along the same shores. The results were not dotted lines. They were a correctly surveyed coast; physical features properly noted and delineated; the collection of a valuable series of Silurian fossils; of a flora which, though meagre, was of considerable scientific interest; of a fauna; and of numerous ethnological specimens throwing light upon the ancient migrations of man. The two methods of exploring will not bear comparison, and they represent the difference between the Spitzbergen route under the most favourable circumstances, in a ship, and the Smith Sound route under the least favourable circumstances, by sledge-travelling parties.

But there is every reason to expect that a well-commanded expedition will be able to proceed for a considerable distance up Kennedy Channel and Robeson Strait, and so attain a position whence far more extensive discoveries may be achieved. It is true that in 1853 a wretchedly equipped little schooner, the 'Advance' (120 tons and seventeen men), was stopped by the ice near the entrance of Smith Sound; but she was wholly unsuited for such navigation, and had not the advantage of steam-power. On the other hand, Captain Inglefield, in 1852, found the sea open in Smith Sound, and was convinced that it was navigable. Dr. Hayes, in 1860, in another unsuitable little schooner of 133 tons, was not stopped by the ice, but by a gale of wind and a heavy sea. The vessel was unfit for the work. In 1871 Captain Hall, in the 'Polaris,' sailed up Kennedy Channel without any check or obstruction to latitude 82° 16′ N., the farthest northern point that has ever been reached by a ship in any direction. If we turn to other straits leading from the head of Baffin's Bay, we shall find that analogy confirms and strengthens the personal observation of Inglefield, Hayes, and Hall. Pond's Bay leads into Eclipse Sound, and thence, by a strait, through Navy Board Inlet, into Barrow's

Strait; and these intricate channels were successfully navigated in 1872. Lancaster Sound and Barrow's Strait are almost always open for some distance, and on two occasions vessels have sailed up them for several hundred miles, as far as Melville Island. Jones' Sound was also navigated for a considerable distance by Captain Lee, in 1848, without any check. The positions of these Sounds, round the head of Baffin's Bay, will be seen on the little map at page 139.

There is, therefore, every reason to expect that, in an ordinarily favourable season, the waters of Smith Sound and Kennedy Channel will be as navigable as those of Lancaster Sound and Barrow's Strait. The expedition will consist of two screw steamers. One will be stationed, so as to preclude all possibility of danger to the more advanced party, in the improbable event of their vessel being lost. The other will press forward as far north as possible, and perhaps winter in 83° or 84° N., or even still nearer to the Pole. From such a position advanced travelling parties could reach the North Pole, and explore the whole of the northern coasts of Greenland and of Grinnell Land. The distance from Cape Parry to the North Pole and back is 968 miles, a distance which has frequently been exceeded by Arctic sledge parties belonging to the expeditions in search of Franklin. A sledge party, led by McClintock, walked 1,210 miles in 105 days; Mecham went over 1,157 miles. The work of these travelling parties will be rendered comparatively easy if the land trends far to the north. As regards the land in that direction, the crew of the 'Polaris,' in 82° 16′ N., saw it on the furthest limit of the northern horizon. Numerous geodetical, magnetic, and meteorological observations can be made. The ships can also avail themselves of recent experience obtained in dredging the sea-bottom, of which nothing whatever is known in Baffin's Bay and Smith Sound.

The above considerations offer convincing proofs that the route by Smith Sound is the best road across the threshold of the unknown region. In an unfavourable season by the Spitzbergen route nothing whatever would be done. In an unfavourable season by Smith Sound 1,600 miles of previously unknown country would be discovered and thoroughly explored, and valuable observations and collections would be made in every department of science. In a favourable season by the Spitzbergen route an ice-laden sea may be penetrated for some distance, and deep-sea soundings may be taken over a previously unvisited area, but there would be no other result whatever. In a favourable season by the Smith Sound route the North Pole would be reached; the northern coasts of Greenland and Grinnell Land would be explored;

their geology, flora, fauna, and ethnology would be investigated; and a vast addition would be made to the sum of human knowledge. By the Spitzbergen route there is the bare chance of doing little. By the Smith Sound route there is the certainty of doing much. It is not by poking about in pack-ice at a distance from land, but by carefully examining hundreds of miles of coast-line, that the most useful work is to be done in the unknown region. Moreover, all observations by the Spitzbergen route would be limited to a few weeks in the summer, whereas the Smith Sound expedition would obtain lengthened, valuable, and complete series.

It will be remembered that the more complete exploration of Gilies and Franz-Josef Lands, and the chance of attaining a higher latitude than has yet been reached on those meridians, are points of interest which are offered by the Spitzbergen route. But they are not of sufficient importance to occupy a Government scientific expedition, and might be left to private enterprise. These are laurels which will rightfully belong to such men as Mr. Leigh Smith, who has so perseveringly and gallantly striven to win them.

The more complete and extensive exploration of the unknown area by Smith Sound must, on the other hand, be achieved by a Government expedition, because thorough preparation and equipment are essential, and because, in the case of large bodies of men passing through an Arctic winter, naval discipline and naval *esprit de corps* are absolutely necessary. The enterprise, though feasible and devoid of undue risk, is one of vast proportions. It is one which, while requiring all the highest qualities of seamen to conduct successfully, and involving dangers and hardships to individuals such as it is the pride of our naval men to laugh at and overcome, is yet absolutely free from a chance of any such catastrophe as overtook Sir John Franklin and his gallant crews. There is great abundance of excellent animal food up Smith Sound. The climate is exceptionally healthy; and though the officers and men who volunteer for this arduous service will be exposed to individual dangers and privations, which will test their high qualities to the utmost, there is no more chance of a disaster to the whole expedition, and far less danger of sickness, than on any other station frequented by the ships of our navy. No work can be conceived more important to science, more useful to our navy, and more worthy of being undertaken by our Government. 'The navy,' said Admiral Sherard Osborn in 1865, 'the navy needs some action to wake it up from the sloth of routine, and save it from the canker of prolonged peace. The navy of England cries not for mere war to gratify its desire for honourable employment or fame. There are other achievements as glorious as a victorious battle; and a wise ruler and a wise people will be careful to satisfy a craving which is the life-blood of a profession. Upon these grounds, as well as those of scientific results, would it be too much to ask for a fraction of the vast sum yearly sunk in naval expenditure for two small steamers and 120 officers and men?' The people of England have answered this question in the same spirit which has led to discoveries and brilliant achievements on almost every part of the earth's surface during the last four centuries.

There were only two objections that could be raised to Arctic exploration: namely, that the danger is so great that, although it has been faced and overcome by our ancestors during three centuries, it is not justifiable to expose the seamen of the present generation to it; and that the expense could not rightly be incurred.

I will first deal with the question of danger, and will quote the evidence of one of the most distinguished medical officers[1] who has served in the Arctic regions to prove that 'of all seas visited by men-of-war the Arctic have proved the most healthy.'

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[1] Dr. J. J. L. Donnet, M.D., Deputy Inspector General of Hospitals and Fleets. This warm hearted and accomplished officer was Surgeon on board H. M. S. 'Assistance,' in the Arctic Expedition of 1850–51.

'This assertion,' he continues,' 'though startling in itself, will find ready credence when it is considered that the precautions necessary to guard against the evils which man encounters in these seas are well and accurately known, and when, from an examination of the tables below, the mortality will be seen to be 1·7 per cent. only.

'The North Polar expeditions which have left the shores of England under the directions of the Admiralty since the ill-fated one commanded by Sir John Franklin have, by the improvements of Arctic travel, by the superior quality and ample quantity of provisions, by the system of warming and of ventilation, given substantial proofs of the truth of this assertion; and the evils which have hitherto been considered as inherent to these seas have, by this advance of knowledge, been dispelled, and men enter upon them with a spirit of enterprise and of love, and may do so with as little dread as those who seek a summer cruise to the shores of the Mediterranean or the Baltic. The real terrors of Arctic voyages were scurvy and starvation. Scurvy, the scourge of the navy in days gone by, is but little known now. Instances of this disease have occurred in several of the late expeditions, but none have presented those characters which, in former times, caused scurvy to be dreaded as plague and cholera are now.

'The expedition commanded by M'Clure was more than three years absent before the first death from scurvy occurred. In Kane's expedition three men died in the space of two years. It will scarcely be credited that the crew of this expedition depended solely upon salt meat and a small supply of fresh vegetables; and had it not been for the resources of their winter quarters—under the 79th parallel—they must all have succumbed to scurvy. McClintock's expedition, consisting of about the same number of souls as Kane's, and absent about the same length of time, had but one death from scurvy; and this was in great measure due to the poor fellow himself, the subject of it, who refused to take the remedies which were offered to him in abundance.

'Neither Kane's nor McClintock's were Government expeditions, and their crews had not been subjected to any medical examination to test their fitness for Arctic service.

'It is to the advanced stage of knowledge in naval hygiene; to the attention paid to the cleanliness, warmth, and ventilation of the ships; to the good quality of provisions, and especially to the preservation of cheerfulness among the crews, that this immunity from scurvy is due; and so rare has it become that the naval surgeons, who possess any knowledge of this disease, derived from actual observation among the crews of royal ships, may be counted upon one's fingers.

'The starvation which caused so much suffering to the men forming Franklin's land expedition, and which it is feared was chiefly instrumental in sweeping away the crews forming his last, can only again occur through some unforeseen and unavoidable accident, such as may happen in the temperate or torrid zone.

'The expedition which will leave the shores of England in the spring of 1875, for the exploration of the North by the proposed way of Smith Sound, will find exceptionally large resources of animal life on the shores of this sound; for it has been proved by Kane, Hayes, and Hall, that walruses, seals, bears, musk oxen and reindeer, besides visitors of the feathered tribe, which flock to these parts during the summer season, are found in abundance on these shores. The route to the North Pole by Smith Sound, with the resources of its shores, and with the great advantage of having *terra firma* to fall back upon, has therefore a superiority over other routes.

'In every sea casualties will occur, but in the Arctic those which have been noted during the last quarter of a century, have been few and far between, and they have arisen chiefly from frost-bites, from which one death alone is recorded. Of those diseases which swell the bills of mortality in England, especially of that class termed zymotic, which includes typhus, typhoid, small-pox, &c., none are known. Chest diseases are ignored among those forming these expeditions, for though deaths have occurred from consumption, the germs have been brought to and not engendered in these seas. It is a circumstance worthy of note that those who suffered from bronchial affections each winter in England, were exempted from them whilst in the Arctic.

'The power of resisting cold is remarkable in the Arctic regions; this power of resistance was observed by Wrangell in the Jakuts, the "iron men of Siberia," of whom he says: "I have seen them frequently in the severe cold of this country, and when the fire had been long extinguished, and the light jacket had slipped off their shoulders, sleeping quietly, completely exposed to the heavens, with scarcely any clothing on, and their bodies covered with a thick coat of rime." The precautions to be taken in these seas are well known; but the chief and the most important is to preserve, by every possible means, cheerfulness of mind among the crew. This contented state of mind is the best guard against scurvy, and upon it is mainly dependent the efficiency of an Arctic expedition.

'The following tables of the Government searching expeditions which wintered out, between 1848 and 1854, will show the remarkably small percentage of deaths arising from all causes:—

SHIPS	Winters out		Complement		Mean for Winter		Addition of time spent on outward and homeward passage, two months for each winter		Mean corrected
Plover	3	×	60	=	180	+	30	=	210
Enterprise	4	×	70	=	280	+	47	=	327
Investigator	5	×	65	=	325	+	54	=	379
Assistance	3	×	90	=	270	+	45	=	315
Resolute	3	×	90	=	270	+	45	=	315
Lady Franklin and Sophia .	1	×	75	=	75	+	12	=	87
North Star	3	×	70	=	210	+	35	=	245
									1,878

	No. of Deaths	
In Ross's Expedition	7	No. of Men, 1,878 Deaths, 32 Percentage of Deaths, 1·7
„ Austin's do.	1	
„ Kellett's do.	6	
„ Belcher's do.	3	
„ Plover's (uncertain) . .	3	
„ Penny's Expedition . .	0	
„ North Star (both expeditions)	3	
„ Collinson's	3	
„ McClure's	5 or 6	
Total of Deaths .	32	

'The risk by climate and disease which is therefore run in a voyage to the Arctic seas—such as a Royal Expedition necessitates—is not greater than that which a ship like the "Challenger" will incur in her voyage of discovery.'

So much for dangers arising from climate. But it has been urged that although the climate may be healthy, the navigation is too dangerous for seamen of this generation to encounter. The answer to this is, that Baffin's Bay is annually navigated by ten or a dozen whalers, and that, since the introduction of steam, no casualties, involving loss of life, have occurred; while the little 'Polaris,' a vessel wholly unfitted for such service, went up Smith Sound, in 1871, as far as 82° 16′ N. and returned. Sir John Franklin's expedition consisted of two sailing ships, with auxiliary steam-power of a very imperfect nature, and both in that respect, as well as in their general equipment, stores, and provisioning, they fell far short of what an Arctic expedition of the present day would have at command; but subsequent events reveal to us that this expedition succeeded in making one of the most remarkable Arctic voyages on record, and that the explorers perished, after abandoning their ships, at a position near the entrance of the Great Fish River, where, had proper foresight been exercised, they could easily have been rescued. Subsequent experience has shown that the fatal omission which led to this catastrophe was the want of proper depôts of provisions being arranged so as to cover the escape of the crews, in the event of disaster to the ships: a measure of precaution which, since that disaster, has always been carefully provided for in all subsequent expeditions with signal success.

The conclusion to be derived from former experience is, that with the introduction of steam-power in Arctic ships, and the remarkable improvements in victualling them, navigation in the Polar seas has been rendered comparatively safe; while those maladies can be warded off, from which seamen suffered in ancient times. Hence, during the searches for Franklin, officers and men sought Arctic service as the most popular employment in the navy. There is no doubt that private expeditions, without naval discipline, inefficiently equipped, and inadequately provisioned, are exposed to great dangers; but so they would be in all other parts of the world. It is for this reason that all officers, with Arctic experience, insist upon the necessity for a Government naval expedition, and for officers and men being under naval discipline and control. In this view Mr. Robeson, the American Secretary to the Navy, now fully concurs. In his recent report to the President, after examining the rescued men of the 'Polaris,' he emphatically says, that 'there is little of either success or safety in any expedition which is not organised, prosecuted, and controlled under the sanctions of military discipline.'

The dangers of Arctic navigation are thoroughly understood; and those who are best acquainted with them, through long practical experience, are the best, indeed the only authorities as to their nature. Sir George Back is not the man to advocate the exposure of his professional brethren to undue risks. No one knows better what those risks are than the brave officer who battled so long with the Spitzbergen ice, who starved with Franklin on the barren lands of Arctic America, and who wintered in the moving pack. Nor are Collinson, Ommanney, Richards, McClintock, Sherard Osborn, Vesey Hamilton, or George Nares the men to give foolhardy advice. Yet all are unanimous in the opinion that, with modern appliances and by working in the light of former experience, there is no undue danger in Arctic service; provided that the expedition is under naval discipline and Government control.

I owe an apology to all my readers for having dwelt so fully upon this disgraceful objection to Arctic exploration; but it has been seriously urged, and it must, therefore, be presumed that, in this generation, there are persons in England who, it is supposed, would be influenced by it. To such men, if they really exist, the answer is, that even if the dangers were such as they describe, Englishmen have faced them before, and will do so again and again. These danger-mongers are willing enough that their countrymen should face far greater dangers to obtain the comforts and luxuries they require. Let them be told that the pursuit of knowledge is at least as good a motive for incurring risks as the pursuit after their luxuries, and that the words of good Sir Humphrey Gilbert have not yet come to be looked upon by his countrymen as other than wise and true:—'He is not worthy to live at all, who, for fear and danger of death, shunneth his country's service or his own honour, since death is inevitable and the fame of virtue immortal.'

At all events, for very shame, let them not seek for arguments from the 'Erebus' and 'Terror,' but rather read and benefit by the following noble letter, written in 1865, by the widow of the gallant Franklin:—

'My dear Sir Roderick,—Although I have little doubt you know from some of our mutual friends that they have written to me on the subject of the Polar Expedition, yet I cannot leave it to them alone to tell you how very deeply I sympathise with the proposed effort, and how sincerely I wish it may be realised. For the credit and honour of England, the exploration of the North Pole should not be left to any other country. . . .

'I am sending you these lines because I do not wish you to think it possible that my interest can flag in anything connected with Arctic enterprise; and though, at first, sad memories of the past made me feel some sickness of heart at the revival of the question, I have struggled against that weakness, and overcome it. . . . It would, indeed, be unreasonable, and much to be deplored, if the fate of my dear husband and his companions were to be made an official objection to all future Arctic exploration. *They* met with the unhappy end which too often befalls the pioneers of tentative and dangerous enterprise, but they rest alone in their awful calamity. Every succeeding expedition sailed with better ships, better equipments, better charts, better supports, and with ever-increasing knowledge; and thus it has happened that no naval service on the face of the globe exhibits, on the average, so few casualties as that in the Polar Seas. You have justly said, that "in the proposed expedition no such calamity can be dreaded, for it has no analogy to the case of Franklin."

'JANE FRANKLIN.'

The question of expense was really the only one which the Government has had to consider; and, in the first place, it must be borne in mind that only one expedition is necessary; the fact of the second vessel being stationed within easy annual communication with England, and other precautions that will be taken, entirely precluding the possibility of its becoming necessary, even under the most unfortunate and improbable combination of circumstances, to despatch such expeditions hereafter. This can be proved to demonstration, and must silence the grumblers who croak about one expedition leading to another and another. At the same time a despatch vessel ought to be sent out, each summer, to keep up communication between the expedition and England, and to bring home invalids.

The cost of the expedition, consisting of two screw steamers, with sixty men each, alone had to be considered. McClintock's voyage in the 'Fox' cost 8,400*l.* Parry's attempt to reach the Pole, in 1827, cost 9,900*l.* Besides the original cost of ships and outfit, the Arctic expedition of 1875 may cost from 40,000*l.* to 50,000*l.* a year, for three years, but the ships, on their return, will fetch a good price. If the solution of the greatest geographical problem that remains to be solved, and the attainment of numerous important scientific results, had not been considered worth the expenditure of so trifling a sum—an expenditure which will be richly and abundantly repaid—the character of the English people, as represented by their rulers, would have been strangely altered. Certain it is that our forefathers would have held that such a sum, appropriated for such an end, was money well spent. There was good reason for the belief that, when the subject received full and fair consideration, the public opinion of the country would approve the despatch of an Arctic expedition, and heartily concur in the propriety of appropriating the necessary sum for so useful and important an object. At present, including the cost of the 'Challenger,' the expenditure for the scientific branch of the naval service is wretchedly inadequate. The total tonnage of the British mercantile marine in 1871–1872 was 7,142,894; and the total effective naval expenditure was 7,807,946*l.*; while the expenditure for the surveying branch was 70,456*l.* In other words —the total effective naval expenditure per ton of British merchant shipping was 1*l.* 1*s.* 11*d.*; and the proportion of expenditure on surveying and scientific investigation, per ton of British merchant shipping, was 2*d.*; while the proportion of each 1,000*l.* of total effective naval expenditure spent on surveying and exploring in the same year was only 9*l.*, or less than 1 per cent. This is deplorable, and it is a state of things which has been getting worse year by year. In the days of Sir Francis Baring, or from 1849 to 1853, the proportion of each 1,000*l.* of naval expenditure spent on surveying and exploring averaged 15*l.* 5*s.*; and it ought now to be at least as high; for, in time of peace, such service is the most useful that can be performed. Surely, then, it was not much to expect that this infinitesimal proportion should be almost imperceptibly augmented, in order that an important and valuable service might be performed.

The results to be derived from Arctic exploration, will be enumerated in the following chapter.

CHAPTER XV.

RESULTS OF AN ARCTIC EXPEDITION.

THE results of scientific importance to be derived from an examination of the unknown area, of 2,500,000 square miles, round the North Pole are as numerous as the region to be explored is extensive. It may be shown that no such extent of unknown area, in any part of the world, ever failed to yield results of practical as well as of purely scientific value; and it may safely be urged that as the area exists, which is mathematically certain, it is impossible that its examination can fail to add largely to the sum of human knowledge. Further it is necessary to bear in mind that the Polar area is, in many most important respects, of an altogether special character, affording exclusive opportunities of observing the condition of the earth's surface, and physical phenomena under certain extreme and singular circumstances, which are due to the relation of this area to the position of the axis of revolution of the terrestrial spheroid, and which have to be considered, not only with reference to the present time, but to the earth's past history. It may be received as certain that discoveries will be made in all branches of science the exact nature of which cannot be anticipated.

But there are also numerous results, the attainment of which makes it desirable to despatch an Arctic expedition of discovery, that can be definitively enumerated.

Foremost among them is the subject of geographical discovery. A problem of great importance and interest will be solved by completing the circuit of Greenland, ascertaining the extent and nature of its northern coast, exploring the land to the westward, and discovering the conditions of land and sea in that portion of the unknown area. A very noble and unmistakeably English work is this. To use the words of Sir Edward Sabine, who himself took no small share in such work in former days:—'It is the greatest geographical achievement which can be attempted, and will be the crowning enterprise of those Arctic researches in which our country has hitherto had the pre-eminence.'

The science of hydrography will be advanced, and some of its chief problems connected with equatorial and polar currents will be solved, by an Arctic expedition. It is surely a matter of deep interest to discover the actual condition of this secluded ocean, which has never yet been cut by the keel of mortal ship. The hydrography of the unknown sea has a most important bearing on the general question of oceanic currents, a question which is of practical consequence to navigation. Our knowledge of the general systems of currents will continue to be very incomplete without an investigation of the currents and deep sea temperatures in the unknown area.

A series of pendulum observations on and near the North Pole will be of essential service to the science of geodesy. Such observations, conducted by Sir Edward Sabine at Melville Island, on the east coast of Greenland, and at Spitzbergen, were among the most valuable results of former Arctic expeditions. Their extension farther north, and to the Pole itself, is a great desideratum. Neither the data for forming a mathematical theory of the physical condition of the earth, nor the means of testing such a theory, are complete without experimental determinations of the intensity, as well as the direction of the force of gravity. Mr. Miller, in a letter to Sir Edward Sabine, lately observed that 'the pendulum observations made by yourself and by Captain Foster would probably be amply sufficient for the determination of the form of the earth, if its surface, and that of every stratum of invariable density, were surfaces of revolution, as has been assumed. Lately, however, doubt has been thrown upon the correctness of this assumption. The importance, therefore, of the determination of the earth's ellipticity in a meridian widely removed from the spots at which pendulum observations have been previously made is greatly increased.' The North Pole is upwards of 600 miles from the nearest point at which the pendulum was swung by Sir Edward Sabine. Thus pendulum observations made by a Polar expedition will be a very valuable contribution to our knowledge of the earth's figure. That knowledge cannot be complete as long as it rests merely on geodetic and astronomical measurements; for both these are essentially connected with the direction of local gravity, and therefore with the distribution and density of the subjacent materials. To obtain any reliable notions of these, Dr. Robinson, of the Armagh Observatory, remarks, 'We can only look to pendulum experiments.'[1]

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[1] The pendulum experiments made by Sir Edward Sabine at many widely separated stations showed that the number of vibrations which a pendulum makes *per diem* is not the same in different parts of the earth. It makes about 240 more vibrations in a day at Spitzbergen than it does when near the Equator, because the force of gravity is greater there. If gravity be very small indeed, the motion of the pendulum will be exceedingly sluggish. Thus, it measures the gravity at different parts of the earth. The proportion of gravity near the Pole to gravity at the Equator is as 180 to 179. Pendulum experiments give the law of change of gravity, and enable us to infer what is the ellipticity of the earth, provided the law of gravitation be true. If the ellipticity, thus found, agrees with that calculated from trigonometrical surveys, it will be a strong proof of the correctness of the law of gravitation. Both methods give a proportion of about 300 : 299. Pendulum observations also afford the means of determining the force of gravity at any place.—See Airy's 'Astronomy,' p. 248.

The extension of research in the phenomena of magnetism and atmospheric electricity, in the vicinity of the Pole, will necessarily be of much scientific importance. So far as the conditions of the climate and the means of an exploring expedition will permit, investigations in all branches of physics in the vicinity of the Pole, where so many of the forces of nature operate in an extreme degree — either of excess or defect—will surely be followed by the acquisition of knowledge which can only be obtained in such exceptional localities.

The study of the Aurora, which is among the most striking phenomena visible on our planet, is almost impossible in low latitudes, while the advance of spectrum analysis has given the means of determining the chemical elements involved, so that all that seems to be required is the means of applying this description of observation, and this can only be secured near the Pole. Mr. Norman Lockyer has pointed out that the separation of the terrestrial lines from the truly solar ones, in the solar spectrum, as seen from the earth's surface, is another important desideratum. But inquiry into it can only be well pursued in high latitudes, where the path of the sun, at low altitudes above the horizon, gives opportunities for the necessary observations, not to be secured elsewhere.

The climate of Europe depends, in no small degree, on the atmospheric conditions of the polar area, in which the development of extremely low temperatures necessarily leads to corresponding extreme changes of pressure, and other atmospheric disturbances, the effect of which is felt far into the temperate zone. For the satisfactory appreciation of these phenomena a precise knowledge of the distribution of land and water within the Polar region is quite necessary, and any addition to our geographical knowledge of the unknown region, accompanied by suitable observations of its meteorology, cannot fail to afford improved means of understanding the meteorology of our own country, and of the earth generally.

Observations of the temperature of the sea at various depths; of temperature and pressure of the atmosphere; and of prevailing winds, with reference to currents, in very high latitudes, will, therefore, form valuable contributions to meteorological science. It may be added that, although all previous observations for temperature at great depths are of doubtful value, owing to the imperfections of the instruments, this defect has now been provided against. The present state of meteorology requires a more thorough investigation of the motions of the earth's atmosphere than has yet been undertaken; and for this important object the less frequented parts of the earth's surface should be studied as well as the most frequented. The hygrometric quality of the air is one that it is most desirable to note by long series of observations in polar latitudes, as an aid in determining the movements of air, similar to that which temperature affords in tracing the currents of the ocean. Meteorological phenomena never yet seen by mortal eye will be observed by the bold explorers who reach the Pole. They will see the sun revolving with a uniform altitude from the day it comes north of the Equator in March until it returns in September, its altitude being equal to its declination.

The Arctic Committee of the Geological Society have reported that a more complete investigation of the geology of the Arctic regions is extremely desirable, both for its scientific importance and the value of its practical results. The existence of a true palæozoic coal formation has been determined, but we require to know its extent and composition. A long list of minerals, many of them extremely rare and valuable, have been found in extreme northern latitudes, and much attention should be paid to their further distribution. Masses of meteoric iron have been recently discovered by the Swedish expedition, extending for a distance of no less than 200 miles; these require further study, and their position determined.

The existence of carboniferous, jurassic, and miocene rocks is known, but much is needed to be done to obtain complete collections of their organic remains. One of the most interesting facts of late years acquired to geological science has been that of a luxuriant and highly organised vegetation of miocene age on the east coast of Greenland, no less than 200 species having been established. Equally important additions have been successively made by the supply of materials for the more certain determination of the large number of species that before could be only provisionally recognised. It is of great importance that determinations based on fragments of leaves should be confirmed by the acquisition of more perfect foliage, as well as of seeds and fruits; such materials would be of great value in illustrating a flora which is in itself of much interest, but this interest is vastly increased when one realises the important inquiries on which such knowledge would throw light. These inquiries are:—

1. The geographical distribution of the miocene flora, as indicated by the agreements and differences between the miocene plants of Arctic Regions and of Central and Southern Europe.
2. The relation of the miocene flora to previous and subsequent vegetations, and its bearings on the present geographical distribution of plants on the globe.
3. The evidence derived from these plants as to the physical conditions of the globe in past geological epochs.

It is likely that additional localities for fossil plants will be discovered, and of necessity additional species be brought to light; for, in the past, such remains have been found as far as explorers have penetrated.

From the important part extreme cold has of late years been found to have played in the last geological period, it would be of much value to have exact determinations of the effect produced on the rocks by the intense cold of the northern regions, and to determine the extent, height, and range of the glaciers, and their effects on the surface of the country, and on the different classes of rocks. Again, it would be interesting to determine the extent of the river floods, and the depths of the channels they have excavated in the Arctic Regions.

Another important and interesting result of the proposed Arctic Expedition would be the investigation of the mollusca, not only of marine, but also of land and freshwater kinds. Of late years that enterprising and scientific nation, Sweden, has done something to increase our scanty knowledge of the Arctic marine shells; but their resources were limited, and not to be compared with those of our own nation. In a geological as well as a zoological point of view, a proper investigation of Arctic Mollusca would be especially valuable.

The palæontological basis of the glacial epoch consists mainly in the identity of certain species which inhabit the Polar Seas and are fossil in Great Britain and elsewhere. But such species may owe their present habitat and position to other than climatal causes, viz. to the action of marine currents. It is quite a mistake to assume that Arctic species are few in number. We know very little about them, because the exploration of the circumpolar seas by means of the dredge is so difficult. But the researches of the Scandinavian zoologists show that the Arctic marine invertebrate fauna is extremely varied and numerous. All fossils should be diligently collected, and their positions accurately noted. The former condition of the climate of the Arctic regions may be thus ascertained, and a new chapter opened in the history of our globe. The mineralogy of the Greenland continent is also important, and the discovery of new veins of cryolite and other valuable minerals is not improbable.

The botanical results of a Polar expedition will be of equal importance. The vegetation of the Arctic regions, in the opinion of Dr. Hooker, throws great light upon the geographical distribution of plants on the surface of the globe. On the return of Sir Edward Belcher's expedition from those regions, a series of rocks collected in the neighbourhood of Disco, by his former fellow-voyager, Dr. Lyall, was placed in Dr. Hooker's hands, containing an accumulation of fossil leaves of plants totally different from any now growing in that latitude. These fossils he forwarded to Professor O. Heer, of Zurich, for investigation, who had brought forward the most convincing proofs that that latitude was once inhabited by extensive forests, presenting fifty or sixty different species of arborescent trees, most of them with deciduous leaves, some 3 or 4 inches in diameter—the elm, pine, oak, maple, plane, &c.; and, what was more remarkable still, evidences of apparently evergreen trees, showing that these regions must have had perennial light. It seemed extremely probable that the vegetation which belonged to the Miocene period extended over a large portion of the Northern Arctic region. It would be of great interest to ascertain whether such vegetation extended even to the Pole; and there is nothing that would give greater assistance in solving this problem than the proposed expedition along Smith Sound. Turning to the existing flora of Greenland, Dr. Hooker has pointed out that, though one of the most poverty-stricken on the globe, it is possessed of unusual interest. It consists of some 300 kinds of flowering plants (besides a very large number of mosses, algæ, lichens, &c.), and presents the following peculiarities:—1. The flowering plants are almost without exception natives of the Scandinavian peninsula. 2. There is in the Greenland flora scarcely any admixture of American types, which nevertheless are found on the opposite coast of Labrador and the Parry Islands. 3. A considerable proportion of the common Greenland plants are nowhere found in Labrador and the Parry Islands, nor, indeed, elsewhere in the New World. 4. The parts of Greenland south of the Arctic Circle, though warmer than those north of it, and presenting a coast of 400 miles long, contain scarcely any plants not found to the north of that circle. 5. A considerable number of Scandinavian plants which are not natives of Greenland are nevertheless natives of Labrador and the Parry Islands. 6. Certain Greenland and Scandinavian plants which are nowhere found in the polar plains, Labrador, or Canada, re-appear at considerable elevations on the White and the Alleghany and other mountains of the United States. No other flora known to naturalists presents such a remarkable combination of peculiar features as this, and the only solution hitherto offered is not yet fully accepted. It is that the Scandinavian flora (which Dr. Hooker has shown evidence of being one of the oldest on the globe) did, during the warm period preceding the glacial—a period warmer than the present—extend in force over the polar regions, including Greenland, the polar American Islands, and, probably, much now submerged land in places connecting or lying between Greenland and Scandinavia; at which time Greenland no doubt presented a much richer Scandinavian flora than it now does. On the accession of the glacial period, this flora would be driven slowly southwards, down to the extremity of the Greenland peninsula in its longitude, and down to the latitude of the Alleghanies and White Mountains in their longitudes. The effect in Greenland would be to leave there only the more Arctic forms of vegetation, unchanged in habits or features; the rest being, as it were, driven into the sea. But the effect on the American continent would be to bring the Scandinavian flora into competition with an American flora that pre-occupied the land into which it was driven. On the decline of the glacial epoch, Greenland, being a peninsula, could be repeopled with plants only by the northward migration of the purely Scandinavian species that had been previously driven into its southern extremity; and the result would be a uniform Scandinavian flora throughout its length, and this an Arctic one, from north to south. But in America a very different state of things would supervene; the Scandinavian plants would not only migrate north, but ascend the Alleghanies, White Mountains, &c.; and the result would be that, on the one hand, many Scandinavian plants which had been driven out of Greenland, but were preserved in the United States, would re-appear on the Parry Islands and Labrador, accompanied with sundry American mountain types, and, on the other, that a few Greenland-Scandinavian types, which had been lost in the struggle with the American types during their northward migration, and which hence do not re-appear in Labrador and the Parry Islands, might well be preserved in the Alleghanies and White Mountains. And, lastly, that a number of Scandinavian plants, which had changed their form or habit during the migration in America in conflict with the American types, would appear in the Parry Islands as American varieties or representative species of Scandinavian plants. Whether or no this be a true hypothesis, it embraces all the facts; and botanists look anxiously to farther explorations in the northern parts of Greenland for more light on the subject, and especially for evidence of rising or sinking of the land in Smith Sound and the countries north and east of it, and for evidence of ancient connection between Greenland and Scandinavia; for observations on the temperature, direction, and depth of transporting currents in these seas, and on the habits of its ruminant migrating animals that may have influenced the distribution of the vegetation by transporting the seeds. Such facts as those of the existence of ancient forests in what are now Arctic regions, and of the migration of existing floræ over lands now bound fast in perpetual ice, appear to some naturalists to call for vaster changes than can be brought about by a redisposition of the geographical limits of land and sea, and to afford evidence of changes in the direction of the earth's axis to the plane of its orbit, and perhaps of variations in the ellipticity of the orbit itself.[1]

The specific results in zoology which may be expected from an Arctic expedition are numerous and interesting. It is known that the Arctic ocean teems with life, and that of the more minute organised beings the multitude of kinds is prodigious: these play a most important part, not only in the economy of organic nature, but in the formation of sedimentary deposits, which in future geological periods will become incorporated with these rock formations, whose structure has only lately been explained by the joint labours of zoologists and geologists.

The kinds of these animals, the relations they bear to one another, and to the larger animals (such as whales, seals, &c., towards whose food they so largely contribute), the conditions under which they live, the depths they inhabit, their changes of form,

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[1] See Dr. Hooker's paper, 'Outlines of the Distribution of Arctic Plants,' in the 'Transactions of the Linnæan Society,' vol. xxiii. p. 251, for a more detailed account of the Arctic plants, their affinities and distribution.

&c., at different seasons of the year, and at different stages of their lives; and, lastly, their distribution according to geographical areas, warm and cold currents, &c., are all subjects of which very little is known.

With regard to the larger animals—the fish, *mollusca*, *echinodermata*, corals, sponges, &c., of the Arctic zones, those of Greenland alone have been well explored. A knowledge of their habits and habitats is much desiderated, as are good specimens for our museums. More important still would be anatomical and physiological experiments, and observations on those animals under their natural conditions. It is also probable that new species may be found in the unknown north. Here may be the last hiding-place of animals like that curious manatee (*Rhytina*) which was last seen by Steller, in 1741, on Behring's Island. Seas which support whales and seals must be tenanted by myriads of fish and of those minute organisms which are disclosed by the dredging machine, while the presence of walrus tells us of submarine forests of sea-weed.

Professor Newton of Cambridge has drawn attention to some interesting questions relating to the migrations of birds, towards the unknown area. He says:—

'The shores of the British Islands, and of many other countries in the northern hemisphere, are annually, for a longer or shorter period, frequented by a countless multitude of birds, which, there is every reason to believe, resort in summer to very high northern latitudes, for purposes the most important, and, since they continue the practice year after year, they must find the migration conducive to their advantage. There must be some water which is not always frozen; secondly, there must be some land on which they may set their feet; and thirdly, there must be plenty of food, supplied either by the water or by the land, or by both, for their nourishment, and that of their progeny.

'It may be worth while to give a short account and to sketch the movements of one species of birds —the Knot—*Tringa canutus* of ornithologists. The knot is something halfway between a snipe and a plover. Examples of it are commonly to be seen in the cage at the southern end of the Fish House in the Zoological Gardens, and may be seen there at the present time. Like many other kinds of birds belonging to the same group, the colour of its plumage varies most wonderfully, according to the season of the year. In summer it is of a bright brick-red; in winter it is of a sober ashy-grey. Kept in confinement, it seldom assumes its most brilliant tints, but some approach to them is generally made. Now the knot comes to this country in vast flocks in spring, and, after remaining on our coasts for about a fortnight, can be traced proceeding gradually northwards till it takes its departure. People who have been in Iceland and Greenland have duly noted its appearance in those countries; but in neither of them is it known to tarry longer than with us, the summer it would there have to endure is not to its liking; and as we know that it takes no other direction, it must move farther north. We then lose sight of it for some weeks. The older naturalists used to imagine it had been found breeding in all manner of countries, but the naturalists of the present day agree in believing that we know nothing of its nidification. Towards the end of summer back it comes to us in still larger flocks than before, and both old birds and young haunt our coasts till November: if the season be a very open one, some may stay later; but our winter, as a rule, is too much for it, and away it goes southwards, and very far southwards too, till the following spring. What has been said of the United Kingdom is equally true of it on the eastern shores of the United States. There it appears in the same abundance and at the same seasons as with us, and its movements seem to be regulated by the same causes.

'Hence we may fairly infer that the lands visited by the knot in the middle of summer are less sterile than Iceland and Greenland, or it would hardly pass over those countries, which are known to be the breeding-places for swarms of water-birds, to resort to regions worse off as regards supply of food. But the supply of food must depend chiefly on the climate. The inference necessarily is that, beyond the northern tracts already explored, there is a region which enjoys in summer a climate more genial than they possess. It would be easy to summon more instances from the same group of birds, tending to show that beyond a zone where a rigorous summer reigns there may be a region endued with a comparatively favourable climate. If so, surely the conditions which produce such a climate are worth investigating.'

The knowledge already acquired of the Arctic regions leads to the conclusion that the discovery of the unknown portion of the Greenland coasts will yield very important results in the science of anthropology. Although barely one-half of the Arctic region has been explored, yet abundant traces of former inhabitants are found throughout their most desert wastes, where now there is absolute solitude. These wilds have not been inhabited for centuries, yet they are covered with traces of wanderers, or of sojourners, of a bygone age. Here and there, in Greenland, in Boothia, on the shores of America, where existence is possible, the descendants of former wanderers are still to be found. The migrations of these people, the scanty notices of their origin and movements that are scattered through history, and the requirements of their existence, are all so many clues which, when carefully gathered together, throw light upon a most interesting subject. The migrations of man within the Arctic zone give rise to questions which are closely connected with the geography of the undiscovered portions of the Arctic regions.

The extreme points which exploration has yet reached on the shores of Greenland are in about 82° on the west and in 76° on the eastern side; and these two points are about 600 miles apart. As there have been inhabitants at both these points, and they are separated by an uninhabitable interval from the settlements farther south, it may be inferred that the unknown interval farther north is or has been inhabited. On the western side of Greenland it was discovered, in 1818, that a small tribe inhabited the rugged coast, between 76° and 79° N.; their range being bounded on the south by the glaciers of Melville Bay, which bar all progress in that direction, and on the north by the Humboldt Glacier, while the *Sernik-sook*, or great glacier of the interior, confines them to the sea-coast. These 'Arctic Highlanders' number about 140 souls, and their existence depends on open pools and lanes of water throughout the winter, which attract animal life. Hence, it is certain that where such conditions exist man may be found. The question whether the unexplored coast of Greenland is inhabited, therefore, depends upon the existence of currents and other conditions such as prevail in the northern part of Baffin's Bay. But this question is not even now left entirely to conjecture. It is true that the 'Arctic Highlanders' told Dr. Kane that they knew of no inhabitants beyond the Humboldt Glacier, and this is the farthest point which was indicated by Kalahierua (the native lad who was on board the 'Assistance') on his wonderfully accurate chart. But neither did the Esquimaux of Upernavik know anything of natives north of Melville Bay until the first voyage of Sir John Ross. Yet now we know that there either are or have been inhabitants north of the Humboldt Glacier, on the extreme verge of the unknown region; for Morton (Dr. Kane's steward) found the runner of a sledge made of bone lying on the beach on the northern side of it. There is a tradition, too, among the 'Arctic Highlanders' that there are herds of musk oxen far to the north on an island in an iceless sea. Traces of these were found by Captain Hall's expedition, in 1871–72, as far north as 81° 30′ N. On the eastern side of Greenland there are similar indications. In 1823 Captain Clavering found twelve natives at Cape Borlase Warren, in 75° N.; but when Captain Koldewey wintered in the same neighbourhood in 1869 none were to be found, though there were abundant traces of them, and ample means of subsistence. As the Melville Bay glaciers form an impassable barrier, preventing the 'Arctic Highlanders' from wandering southwards on the west side, so the ice-bound coast on the east side, between Scoresby's discoveries and the Danebrog Isles, would prevent the people seen by Clavering from taking a southerly course. The alternative is that, at the time of Koldewey's visit, they must have gone north.

These considerations lead to the conclusion that there are, or have been, inhabitants in the unexplored region to the north of the known parts of Greenland. If this be the case, the study of all the characteristics of a people who have lived for generations in a state of complete isolation would be an investigation of the highest scientific interest.

Light may not improbably be thrown upon the mysterious wanderings of these northern tribes, traces of which are found in every bay and on every cape in the cheerless Parry group; and these wanderings may be found to be the most distant waves of storms raised in far-off centres, and among other races. Many circumstances connected with the still unknown northern tribes may tend to elucidate such inquiries. Thus, if they use the *igloo*, they may be supposed to be kindred of the Greenlanders; snow huts will point to some devious wanderings from

Boothian or American shores; while stone *yourts* would indicate a march from the coast of Siberia, across a wholly unknown region. The method of constructing sledges would be another indication of origin, as would also be the weapons, clothes, and utensils. The study of the language of a long isolated tribe would also tend to elucidate questions of considerable interest; and its points of coincidence and divergence, when compared with Greenland, Labrador, Boothian, and Siberian dialects, will lead to discoveries which, probably, could not otherwise be made. Dr. Hooker has pointed out that the problem connected with the Arctic flora can be solved only by a study of the physical conditions of much higher latitudes than have hitherto been explored. In like manner, the unsolved puzzles connected with the wanderings of man within the Arctic zone may depend for their explanation on the clues to be found in the condition of a tribe or tribes in the far north.

These are speculations which the results gained by Polar discovery would probably, but not certainly, show to be well founded. But there are other investigations which would undoubtedly yield valuable materials for the student of man. Such would be carefully prepared notes on the skulls, the features, the stature, the dimensions of limbs, the intellectual and moral state of individuals belonging to a hitherto isolated and unknown tribe; also on their religious ideas, on their superstitions, laws, language, songs, and traditions; on their weapons and methods of hunting; and on their skill in delineating the topography of the region within the range of their wanderings.

The condition of an isolated tribe, deprived of the use of wood or metals, and dependent entirely upon bone and stone for the construction of all implements and utensils, is also a subject of study with reference to the condition of mankind in the Stone Age of the world; and a careful comparison of the former, as reported by explorers, with the latter, as deduced from the contents of tumuli and caves, will probably be of great importance in the advancement of the science of man.

But the unknown results of exploration must also have their due weight. Judging from analogy, we may be sure that many of the discoveries of the Polar explorers will be unforeseen and unexpected. The learned President of the American Geographical Society, in June 1871, well said that we do not know and cannot estimate, in anticipation, the consequences that will result from a more accurate knowledge of our globe. 'Columbus,' he added, 'found very few who would sympathise with him, or who perceived the utility of the effort on his part to go out into the unknown waste of waters beyond the Straits of Gibraltar, in search of a new country. Who can, at this time, estimate the advantages which have followed upon that adventure! If now it should be possible to reach the Pole, and to make accurate observations at that point, from the relation which the earth bears to the sun and to the whole stellar universe, the most useful results are very likely to follow, in a more thorough knowledge of our own globe.'

An expedition for North Polar discovery by way of Smith Sound will yield most valuable scientific fruits, will involve no undue risks, and will entail an expenditure which is utterly insignificant when compared with the value of its results. For these reasons, it deserved that cordial support from the people of this country which has induced the Government to undertake it. When it is remembered how beneficial are the indirect advantages invariably derived from voyages of discovery, and how important it is that naval officers, who are breaking their hearts from the impossibility of getting active employment, should have some additional chances opened to them, an interest will be felt in these voyages even by men whose education does not enable them to understand their scientific value. The same enterprise, courage, endurance, and presence of mind are required to conduct an Arctic expedition as to face an enemy in the field; though in the former case these qualities are merely exercised in advancing civilisation, extending knowledge, and exciting friendly sympathy and interest throughout the world. For a time we have done with wars. Let us hope that we have done with arbitrations. Now, then, is the time for old England to take her place once more in the van of Arctic discovery. 'It can be done, and England means to do it!'

CHAPTER XVI.

THE ARCTIC EXPEDITION OF 1875.

An Arctic Expedition will sail from England in the spring of 1875, to accomplish many if not all of the objects enumerated in the preceding chapter, and, among them, to reach the North Pole of our earth.

It has taken ten years of work before the People and the Press of England could be educated to the point which would make it politic for the Government to despatch a naval expedition of discovery to cross the threshold, and to explore the unknown region. When M'Clintock returned in the 'Fox' everything was rife for the renewal of voyages of discovery, the best and most useful work upon which our navy can be employed in time of peace, but the old spirit of adventure could not then be aroused. The officers and men who had developed the modern system of sledge travelling were still in the prime of life, and longing to use the experience they had acquired in the searches for Franklin; and many of them felt that at least an effort should be made to obtain the renewal of Arctic discovery.

Seldom has there been a larger and more enthusiastic gathering, at a meeting of the Royal Geographical Society, than on January 23, 1865, when Sherard Osborn read his first paper on the exploration of the North Polar region.[1] In glowing language he urged the solid reasons for undertaking Arctic discovery, and then explained the direction a Polar Expedition should take with the least risk and the greatest probability of success, the mode in which such an expedition should be conducted, and the scientific results likely to accrue. But the time had not yet come. The same effort was renewed in January 1872, when Sherard Osborn read a second paper; and it was then found that the endeavours made in the interval to familiarise the public with the importance of Arctic exploration had not been without result. He was almost unanimously supported by the press; and the Council of the Royal Geographical Society appointed an Arctic Committee to consider the best route for an expedition, and the results to be derived from it. On April 29, 1872, the President and Council unanimously adopted the Report of the Committee; and encouraging replies were received to communications addressed to the Royal, Geological, Linnæan, and Scottish Meteorological Societies, and the Anthropological Institute. It was, therefore, resolved to bring the matter before

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[1] See 'R. G. S. Journal,' xxxvi. p. 279.

Her Majesty's Government, and it was arranged that a deputation, headed by the President, Sir Henry Rawlinson, should be received by two of the Ministers. Accordingly Mr. Lowe and Mr. Goschen received the Arctic Deputation on December 16, 1872; and, after some conversation, dismissed it with the assurance that the subject should receive careful consideration. On January 1, 1873, an unsatisfactory letter from the Chancellor of the Exchequer was received by Sir Henry Rawlinson, declining to send out an Arctic Expedition that year, on the plea that 'the public revenue had to bear the main burden of the expenses of the operations entrusted to the "Challenger."'

But the goal was now in sight. The feeling of the country was in favour of the renewal of Arctic discovery; the spirit of enterprise was once more aroused, and eventual success was certain. It was but a question of time. In the spring of 1873 Commander A. H. Markham, at the suggestion and under the auspices of Admiral Sherard Osborn, made his voyage to Baffin's Bay, as a preliminary measure, and to report upon the new system of ice navigation which the introduction of steam has given rise to. At the same time the Royal Society, under the presidency of that illustrious botanist and Antarctic navigator, Dr. Hooker, cordially united its efforts with the Royal Geographical Society, under the presidency of Sir Bartle Frere, and a Joint Committee of the two Societies was appointed to prepare an exhaustive Memorandum on the scientific results to be derived from Arctic exploration, and on the reasons why such researches can best be successfully accomplished by a naval Expedition despatched under Government auspices, and secured as far as possible from failure or disaster by careful navigation and good discipline.[1] The Joint Committee was composed as follows:—

Royal Society.	Royal Geographical Society.
Dr. J. D. Hooker, C.B., P.R.S.	Admiral Sir George Back, D.C.L., F.R.S.
George Busk, Esq., V.P.R.S.	Admiral Collinson, C.B.
J. Prestwich, Esq., F.R.S.	Admiral Ommanney, C.B., F.R.S.
Dr. Carpenter, F.R.S.	Admiral Sir Leopold McClintock, F.R.S.
Dr. Allman, F.R.S.	Admiral Richards, C.B., F.R.S.
John Evans, Esq., F.R.S.	Admiral S. Osborn, C.B., F.R.S.
General R. Strachey, C.S.I., F.R.S.	Clements R. Markham, Esq., C.B., F.R.S.
James Fergusson, Esq., F.R.S.	A. G. Findlay, Esq.

Their joint Memorandum was submitted to Mr. Gladstone by Sir Bartle Frere, with the request that the Prime Minister would receive a deputation to explain to him the reasons for a renewal of Arctic exploration, consisting of representatives of the

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[1] The text of the Arctic Memorandum is printed as an Appendix to 'A Whaling Cruise to Baffin's Bay,' by Commander A. H. Markham, R.N., F.R.G.S. (Sampson Low & Co. 1874.)

Royal Society, the Royal Geographical Society, the British Association, and the Dundee Chamber of Commerce. But another unsatisfactory letter was received from Mr. Gladstone on November 29, 1873, stating vaguely that survey operations have a stronger claim to consideration than those of discovery. To this letter Sir Bartle Frere wrote a conclusive reply, dated December 6, 1873. Fully concurring in the obvious fact that the means at the disposal of the hydrographer are far less than the requirements of our commerce demand, he expressed himself unable to understand why the neglect of ordinary surveys should be a reason for neglecting discovery; and he urged that service in the Arctic seas was one of the best possible schools for seamen, and one of the few schools which now remain by which a thorough seaman can be formed. He submitted for consideration the Memorandum drawn up by the joint Committee, and again requested Mr. Gladstone to receive the deputation at an early date. But no reply was received to this letter; and in February 1874, the Ministry resigned. Sir Bartle Frere was succeeded by Sir Henry Rawlinson, as President of the Royal Geographical Society, in the following May.

On August 1, 1874, Dr. Hooker, the President of the Royal Society, Sir Henry Rawlinson, the President of the Royal Geographical Society, and

Admiral Sherard Osborn, had an interview with Mr. Disraeli on the subject of despatching an Arctic Expedition in 1875. They represented the important scientific and commercial results to be obtained; the great advantages of such enterprises to the naval service, and informed him respecting the practical details. The Arctic Memorandum was submitted, with other papers; and the Prime Minister promised to read them, and to consider the subject carefully, with a view to an early decision.

That decision was one which has received the unanimous and enthusiastic approval of the whole nation. It was one which was worthy of the Government of a great maritime country, and it proves that the feeling that led to the despatch of previous voyages of discovery, the achievements of which form one of the most glorious chapters in our history, is not yet dead amongst us. It was announced in the following letter from the Prime Minister to the President of the Royal Geographical Society:—

‘10 Downing Street, Whitehall,
Nov. 17, 1874.

‘Dear Sir Henry Rawlinson,—Her Majesty's Government have had under consideration the representations made by you on behalf of the Council of the Royal Geographical Society, the Council of the Royal Society, the British Association, and other eminent scientific bodies, in favour of a renewed Expedition, under the conduct of Government, to explore the region of the North Pole; and I have the honour to inform you that, having carefully weighed the reasons set forth in support of such an Expedition, the scientific advantages to be derived from it, its chances of success, as well as the importance of encouraging that spirit of maritime enterprise which has ever distinguished the English people, Her Majesty's Government have determined to lose no time in organising a suitable Expedition for the purposes in view.—I remain, yours faithfully,

'B. DISRAELI.

'Major-General SIR HENRY RAWLINSON, K.C.B.'

Thus the navy of England will once more resume its legitimate work in time of peace by adding to the Arctic achievements of former days, and by emulating the deeds of those naval worthies of our nation who have reaped immortal renown in the northern seas.

The Arctic Committee, appointed by the Lords of the Admiralty to advise them on all subjects connected with the Expedition, consists of Admiral Richards, Admiral Sir Leopold McClintock, and Admiral Sherard Osborn.

The first and most important point was the decision respecting the complement and the selection of officers. Captain George S. Nares is to command the Expedition. This distinguished officer was a mate on board the 'Resolute' in the Arctic Expedition of 1852-54, when he took an active share in the winter amusements, and did his part manfully as a sledge traveller. He acted in the theatricals, and gave a series of lectures to the men on winds and on the laws of mechanics. In the travelling he was away twenty-five days in the autumn of 1852, and travelled over 184 miles. In the spring of 1853 he was auxiliary to Lieutenant Mecham,[1] and travelled over 665 miles in sixty-nine days. In 1854 he started in the intense cold of March, and went over 586 miles in fifty-six days. He has thus had considerable experience, and will be a connecting link between the former and the present generation of Arctic officers. After his polar service Captain Nares was First Lieutenant of the 'Britannia,' training ship for naval cadets. He has published a valuable work on seamanship. He commanded the 'Salamander' surveying ship, on the east coast of Australia, and in Torres Straits, in 1866 and 1867; and he afterwards surveyed the Gulf of Suez in the 'Shearwater.' From 1872 to 1874 he commanded the 'Challenger' during her important scientific expedition, the operations of which have made such large additions to our knowledge of ocean currents and temperatures. Captain Nares returned to England from Hong Kong in January 1875, and took command of the Arctic Expedition.

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[1] See p. 185.

Captain H. F. Stephenson, recently promoted out of the Royal Yacht, will command the second ship.

Commander Albert H. Markham is the second in command in the advance ship. This officer entered the Navy in January 1856, and served for eight years in China, during which time he was present at several actions in the war, and was promoted in 1862 for his gallant conduct in the capture of a piratical junk. From 1864 to 1867 he was a Lieutenant in the Mediterranean flag-ship 'Victoria,' and from 1868 to 1871 was First Lieutenant of the 'Blanche' on the Australian station. In 1871-72 he commanded the steam sloop 'Rosario' during a cruise among the Santa Cruz and New Hebrides Islands, when he was employed to investigate and report upon the cases of kidnapping, and on the murders committed by the islanders. This difficult duty was performed with tact and judgment; and, after a short service as First Lieutenant of the 'Ariadne' training ship, he was promoted to the rank of Commander on November 30, 1872. In that year he undertook a voyage to Baffin's Bay and Prince Regent's Inlet, in order to acquire experience in ice navigation, and his work on the subject, 'A Whaling Cruise in Baffin's Bay,' contains the latest account of the operations of the whaling fleet, as well as the Memorandum of the scientific results to be secured by Arctic exploration. Commander Markham served on board the 'Sultan,' in the channel fleet, from October 1873, to December 1874, and was appointed to the Arctic Expedition on December 8th, 1874.

Besides the captain and commander, there will be four lieutenants in the advance ship. One of them will be Lieutenant Pelham Aldrich, who attained that rank in September 1866, and has since 1872 been serving as First Lieutenant of the 'Challenger.' The other executive officers of the expedition will be Lieutenants Beaumont, Giffard, Parr, May, Archer, Rawson, and Fulford, and Sub-lieutenants Egerton and Conybeare. The medical staff will consist of Dr. Colan, M.D., who served, with distinction, during the late operations on the Gold Coast; and Dr. Moss, recently in charge of the Esquimalt hospital in Vancouver's Island. The Assistant paymasters in charge will be Mr. Mitchell and Mr. Whiddon; the engineers, Messrs. Melrose, Pitt, White, and Wootton. Besides the medical staff there will be a scientific civilian in each ship. Each officer will undertake some special duty connected with the objects of the Expedition, and no pains will be spared to ensure successful results.

With the exception of three ice quarter-masters for each ship, selected from amongst the most experienced whaling seamen, the crews will consist of man-of-war's men. A Danish dog-driver and interpreter, named Karl Petersen, who was up Smith Sound with Dr. Hayes in 1860, and afterwards cooper at Upernavik, has also been engaged and entered. The complement will be about sixty officers and men for each ship.

The exploring vessels have already been selected. The first is the 'Alert,' a steam sloop of 1,045 (751) tons, and 381 (180) H. P. She is now in dock at Portsmouth, where she will be thoroughly overhauled and strengthened for her encounters with the ice, and fitted with new engines and boilers. The second ship is the 'Bloodhound,' a fine steamer built for whaling. by Messrs. Stephen of Dundee, about two years ago, and bought by the Admiralty. She has also been sent round to Portsmouth to be strengthened and fitted for an exploring ship. The 'Bloodhound' is 160 feet long, with 29 feet beam, and 18 feet depth of hold, tonnage 856 (579). Both the 'Alert' and 'Bloodhound' will receive new names when they are commissioned for the Arctic Expedition.

Sailing in the spring of 1875 with three years' provisions, the expedition will proceed up Smith Sound to the scene of its future achievements. In a previous chapter we have enumerated some of the results that will be secured from the discovery and examination of the unknown area. These, and not the mere reaching a particular spot on the earth's surface, are the main objects of the Expedition. The North Pole is merely a spot where the sun's altitude is equal to its declination, and where bearings must be obtained by reference to time and not to the magnet. It will doubtless be reached in the course of exploration, and there is something which takes the imagination of ignorant and uncultivated persons in the idea of standing upon it. But this will not be the main or even a principal result of the Expedition. The objects in view are the discovery of the conditions of land and sea within the unknown area, and the investigation of all the phenomena in that region, in the various branches of science. These results can only be obtained by facing difficulties, perils, and hardships of no ordinary character; but their vast importance, owing to the additions they will make to the sum of human knowledge, will be an ample recompense.

The threshold of the unknown region will be resolutely crossed by the countrymen of those explorers who discovered the North-West Passage, who reached the highest latitude hitherto attained, and who have trodden the edge of the unknown area for thousands of miles. The tradition of English polar adventure will thus be continued, and the noble work will be carried onward by another generation, with the advantages of the accumulated experience of their predecessors, of new appliances, and of recent improvements in provisioning and equipments. England will watch and applaud the efforts of this vanguard of her chivalry while, in the face of obstacles which Britons love to encounter and to overcome, our naval explorers are gallantly forcing their way across the threshold of the unknown region. God speed their noble exertions!

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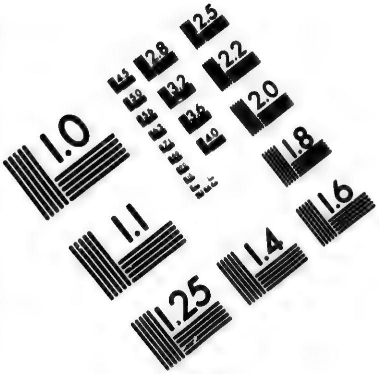

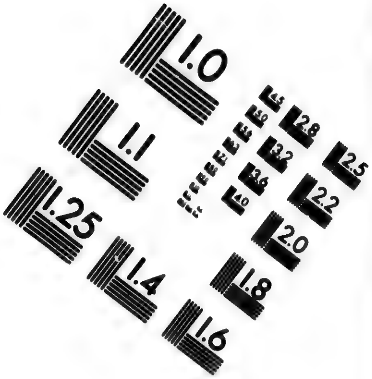

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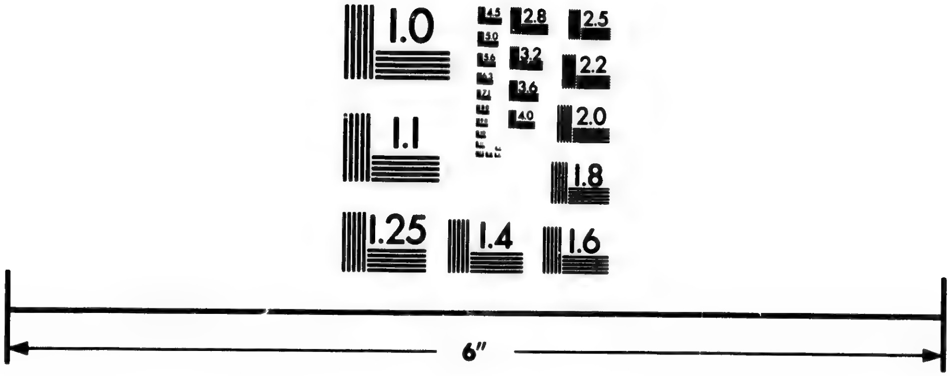

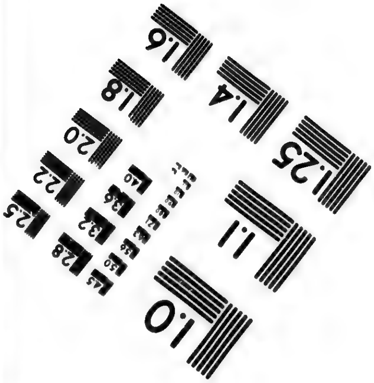

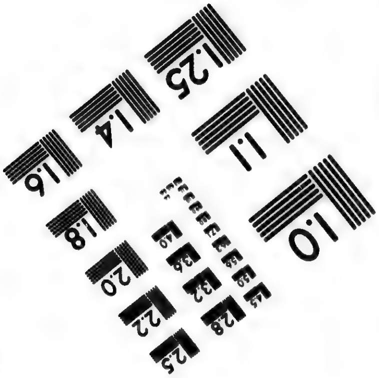

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